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September 1951

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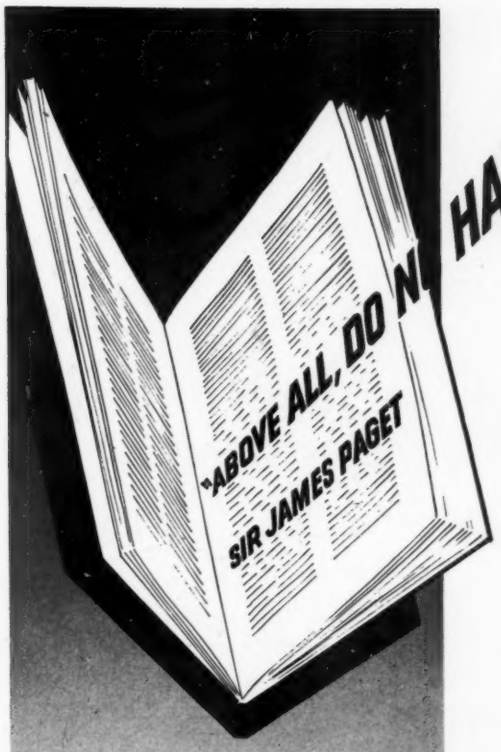

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2. Hopkins, J. G., Hillegas, A. B., Ledin, R. B., Rebell, G. C., and Camp, E., J. Invest. Dermat., 7:237-253, 1946.
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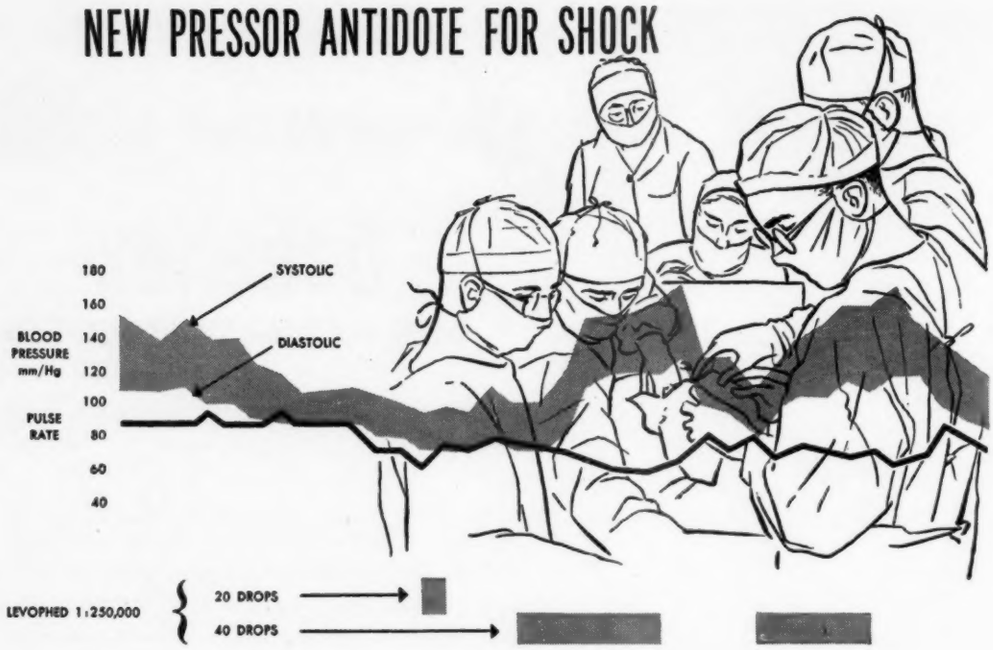

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The American Journal of Surgery

VOL. LXXXII — Contents · September, 1951 — NUMBER THREE

Editorial

MULTIPLE PRIMARY MALIGNANCIES . . . . . *Hymen D. Stein and Albert Behrend* 303

Original Articles

STUDIES IN WARTIME ANESTHESIA . . . . . *Richard Foregger* 306

This paper records the experiences of one anesthetist in the field during World War II. The equipment and supplies available for anesthesia purposes are described.

ENLARGEMENT OF THE MALE BREAST IN NAVAL PERSONNEL . . . . *Norman Lenson* 325

Consideration of the incidence, physical findings, distribution, trauma, familial history, diagnosis, treatment and pathology of enlargement of the male breast in naval personnel. In 118 cases of gynecomastia studied no instance of malignancy was found.

CONSIDERATION OF ACUTE CHOLECYSTITIS. AN ANALYSIS OF SEVENTY-SIX CASES . . . .
Hugh A. Bailey and Lawrence B. Thrush 328

Report of a study of seventy-six cases of acute and subacute cholecystitis giving the symptomatology and physical findings; also, when to operate, type of operation depending on the pathologic findings and a consideration of mortality in the debilitated and aged.

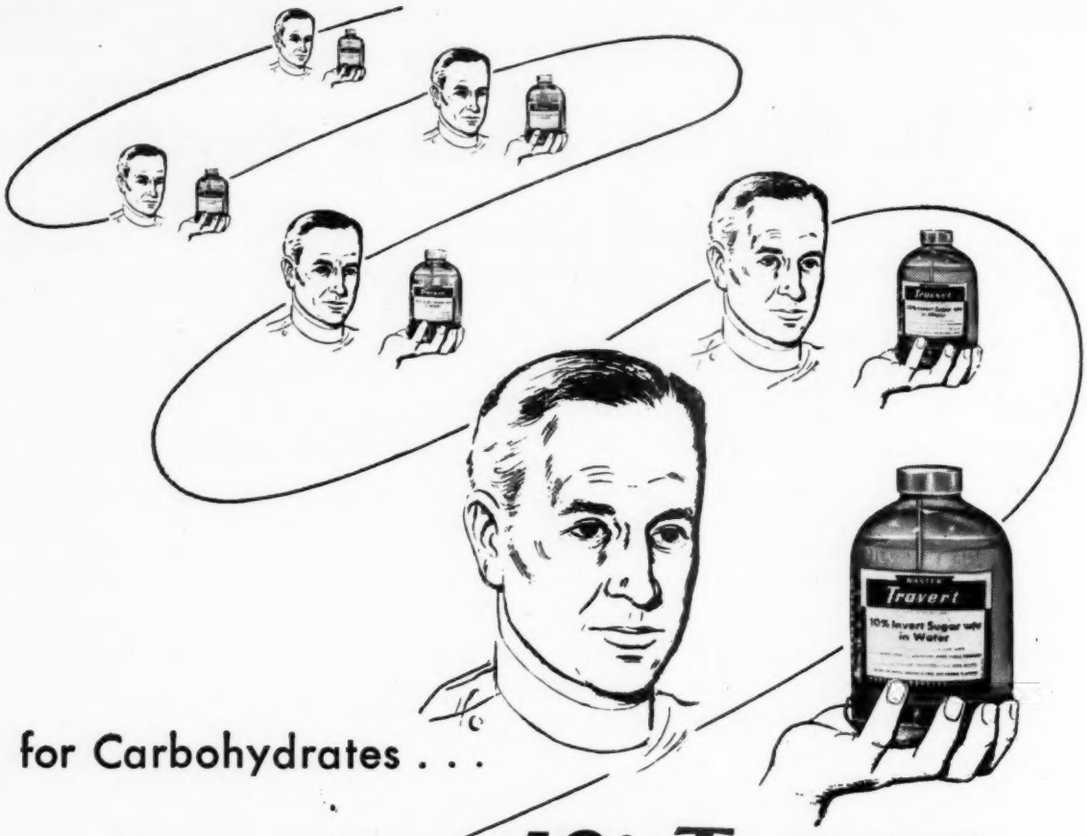
USE OF ANTIBIOTICS AND CHEMOTHERAPY IN SINUS AND MASTOID INFECTIONS . . . .
Anchise A. Cirillo 334

Ten cases demonstrating varying complications of otitic infection in the face of chemotherapy and antibiotic therapy are presented. It is urged that the powerful therapeutic agents now available be used with discrimination.

SURGICAL ANATOMY OF THE SPLENIC VEIN . . . . . .
Aaron B. Gerber, Maurice Lev and Samuel L. Goldberg 339

A thorough, painstaking study and research on the surgical anatomy of the splenic veins, valuable to surgeons working in this field.

Contents Continued on Page 5



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VOL. LXXXII — Contents • September, 1951 — NUMBER THREE

STELLATE GANGLION BLOCK. THE TISSUE DISPLACEMENT METHOD . *Donald W. Smith* 344

A simple and relatively safe method of stellate block. The technic is described in detail.

SURGICAL MANAGEMENT OF ACUTE (SUDDEN) PERFORATION OF SIGMOID DIVERTICULA . . *LeRoy Jay Hyman and Samuel O. Freedlander* 349

A general consideration of acute perforations of sigmoid diverticula. The different methods of treatment are described and the authors suggest another surgical procedure which may have distinct advantages when technically feasible.

RUPTURE OF THE UTERUS . . . . . *Joseph Patrick Donnelly* 354

The causes of rupture of the uterus are enumerated. Early diagnosis, immediate operation and the rapid replacement of whole blood are the three most important steps in the treatment.

URETHRAL DIVERTICULUM IN WOMEN . . . . . *Maurice Rashbaum* 360

Diverticulum of the female urethra is more common than suspected. Symptomatology and methods of diagnosis are outlined, with an operative procedure described and a discussion of the related anatomy.

ABDOMINAL PREGNANCY . . . . . *Arthur S. MacGregor* 365

A study of abdominal pregnancy based on eleven cases. The incidence of abdominal pregnancy, age incidence, gravity, influence of color, symptoms and technic of operations are covered.

CARCINOID TUMORS OF THE GASTROINTESTINAL TRACT . . . . . *Kenneth W. Warren and Capt. Edwin B. Coyle* 372

The diverse localization and varied clinical expression of carcinoid tumors of the gastrointestinal tract are discussed. The malignant characteristics of these neoplasms are emphasized. Case reports of carcinoid tumors of the stomach, ampulla of Vater, ileum, colon and appendix are appended.

FATE OF FROZEN HOMOGENOUS BONE TRANSPLANTS . . . . *Albert G. Marrangoni* 378

The author in an experimental study concludes that the fate of frozen homogenous bone transplants is similar to autogenous bone transplants except they are slower in returning to normal consistency, they are not viable but maintain their ability to stimulate osteogenesis, and bone chips and cancellous bone transplants are superior to frozen homogenous cortical transplants.

THYROIDITIS . . . . . *Leonard K. Stalker and Charles D. Walther* 381

The diagnosis of thyroiditis is frequently overlooked. A review of some of the diagnostic and therapeutic problems, together with typical case reports (one unusual) is presented.

Contents Continued on Page 7

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VOL. LXXXII — Contents • September, 1951 — NUMBER THREE

POLYPS OF THE LARGE INTESTINE . . . . . .S. W. Moore 390

A consideration of polyps of the large intestine, which are of frequent occurrence. All polyps should be removed. In polyposis a complete colectomy with proctectomy should be performed.

Modern Operative Technics

OPEN METHOD OF FREE SKIN GRAFTING. . . . . John A. Jenney 396

A discussion of and the technic of an open method of free skin grafting.

Case Reports

SOLITARY EOSINOPHILIC GRANULOMA OF RIB . Robert T. Fox and James Carswell, Jr. 402

A case of solitary eosinophilic granuloma of a rib treated with local resection is reported.

PRESACRAL NEUROFIBROMA . . . . . Mark E. Gann and Elmer Hoffman 405

This article is a review of Middeldorpf tumors and presacral neurofibromas. Description of a case of presacral neurofibroma is given, the fourth such to be reported.

USE OF THE POLYETHYLENE CATHETER FOR JEJUNOSTOMY FEEDING. . .Francis C. Usher 408

Polyethylene tubing used in jejunostomy feeding, with a report of three cases in which it was employed.

New Instruments

DESCRIPTION OF THE MEYERDING HIP AND SHOULDER BONE SKID . Henry W. Meyerding 411

STERILE LIGHT FOR ATTACHMENT IN THE OPERATIVE FIELD . . . Kenneth J. Strully 412

Advertising Index on 3rd Cover

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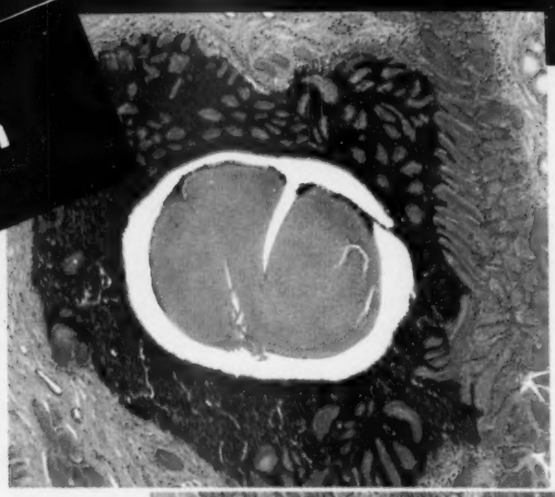

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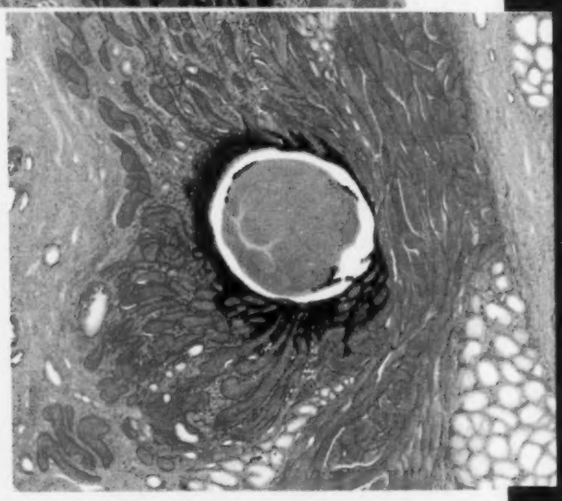

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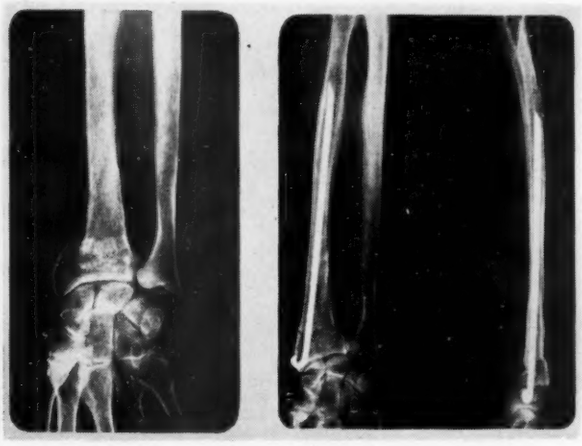

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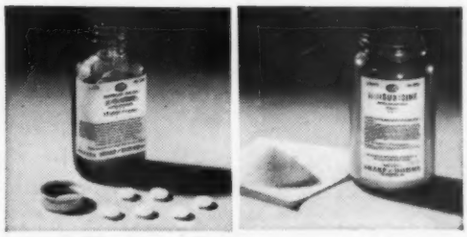

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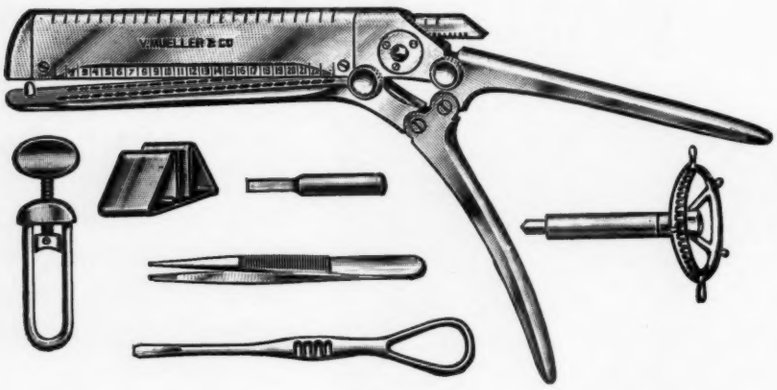

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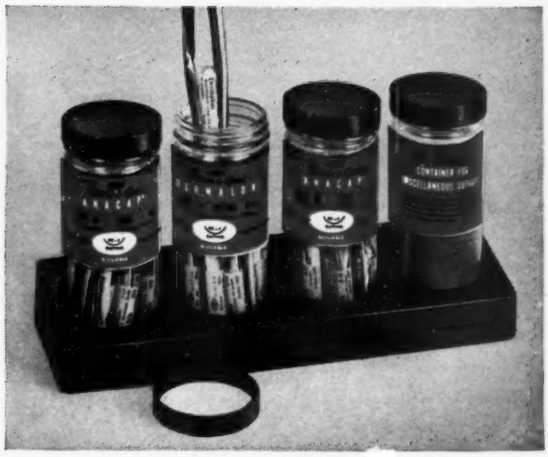

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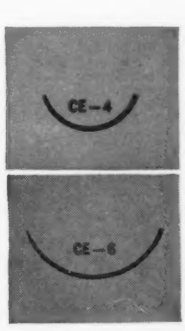

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For replacement, these and other jars of one dozen D & G tubed sutures in germicidal solution are available through our surgical supply dealers (Davis & Geck's new DJ line). Prepare now for emergencies. Order your Emergiset today.

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A Product of **Upjohn** *Research*

an easy-to-take caloric supplement of small volume whose 1-micron-sized fat particles are better tolerated than the large dietary fat globules.

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an easy-to-prescribe supplement. Two tablespoonfuls in a glassful (8 fluidounces) of milk, four times daily, supplement the regular diet with a total of 1,040 calories, daily.

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good for the appetite. It is not a satiety-producing medication; rather it may cause "a very marked increase in appetite" described as "a constant urge to eat" in a significant number of patients.[1]

Liponul-Oral, providing 120 calories per fluidounce, contains vegetable oil 10% w/v and dextrose, anhydrous, 10% w/v, preserved with sodium benzoate 0.1%.

Supplied in one pint bottles

1. Shonkim, M., van Italie, T. B., Geyer, R. P. and Stare, F. J.: J. Amer. Dietet. A., 27:197 (March) 1951.

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Full Codeine Effects...

on Small Codeine Dosage

By utilizing the principle of synergistic enhancement in its fullest logical form, Phenaphen with Codeine provides *high* analgesia and sedation on relatively *low* codeine dosage, with reduced side-effects. The analgesics (aspirin 2½ gr. and phenacetin 3 gr. per capsule) and sedative (phenobarbital ¼ gr.) effectively potentiate a small dosage of codeine (either ¼ or ½ gr.). And the addition of the spasmolytic hyoscyamine (0.031 mg.) —to implement the analgesic-sedative action, and to help counteract any tendency to nausea or constipation so often provoked by codeine medication—provides a combination that has "proved practically always successful" for patients with steady pain.

ANXIETY

the Pain Reaction is a State of Mind

INSOMNIA

Phenaphen® with Codeine

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● Enjoy the feeling of working with fine equipment. The new Ritter Universal Table, Model B, Type 2 offers you the ultimate in ease of operation. All adjustments are within easy reach of hand or foot with adjustment to any position accomplished quickly and effortlessly. This table offers the flexibility necessary to handle all types of treatments. Your professional skills can be utilized in a position most comfortable and efficient for you. Always work at your comfort level with a Ritter Universal Table.

The Ritter Universal Table has a motor-driven hydraulically operated base which raises patients rapidly and smoothly. Elevation range from 26½″ - 44½″, table top to floor. Rotates 180° on a sturdy base which prevents accidental tilting. Overall length of table with both headrest and knee rest extended is 80″ by 23″ wide. Patients enjoy the comfort of air foam sponge rubber cushions covered with vinyl coated nylon fabrics.

Ask your Ritter dealer for more information about the seven models in the *complete* new line of Ritter Multi-Purpose Tables.

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Whether it's an instrument described in this month's journals or one that is part of a classic technic, look to KNY-SCHEERER to supply your needs.

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A. 8260. The new Chapman's Foetoscope, devised by Dr. Eugene R. Chapman, Associate Professor of Clinical Obstetrics, Baylor University Graduate School of Medicine. This new instrument, with rubber finger grips and metal head piece for bone conduction, adds new clarity of breath and heart sounds.

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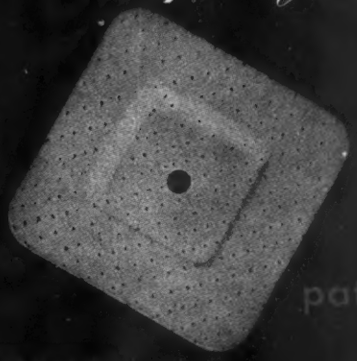

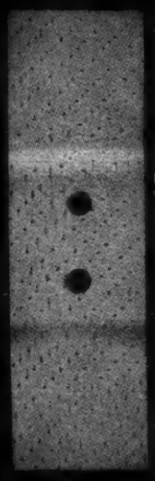

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ELASTIC — they stretch with every movement

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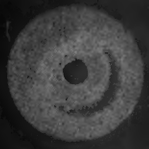

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they blend with skin

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Tri(diethylaminoethoxy) benzene triethyliodide

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20 mg. per cc.

For Intravenous Use

An Effective Curarizing Agent for Surgical and Nonsurgical Procedures Requiring Muscular Relaxation

Advantages

FLAXEDIL, in dosage adequate for relaxation of skeletal muscle, produces no consistent pharmacologic effects on the central nervous system, on pain thresholds, on consciousness, nor on cerebration.

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FLAXEDIL apparently exerts no effect on the parenchymal tissues. It does not impede liver metabolism nor interfere with urinary excretion; and is speedily eliminated in the urine.

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20 mg. per cc.—Vial of 10 cc.

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PREVENT

Postpartum Hemorrhage with KOAGAMIN®

An aqueous solution of oxalic and malonic acids for parenteral use
In 10 cc. diaphragm-stoppered vials.

DeLee and Greenhill* point out that it is advisable to stop all postpartum hemorrhaging as soon as possible since the patient's constitution is an unknown factor and thinned blood loses its clotting power.

Routine use of KOAGAMIN® as a preventive against hemorrhage in labor is suggested. KOAGAMIN'S action is usually clocked in minutes—compared with vitamin K, useful only where prolonged prothrombin time is involved. In these cases, KOAGAMIN is recommended in addition to effect faster control.

THERAPEUTICALLY KOAGAMIN is effective in many hemorrhagic conditions prophylactically and therapeutically.

PREOPERATIVELY KOAGAMIN minimizes oozing; assures an uncluttered field of operation.

POSTOPERATIVELY KOAGAMIN controls secondary bleeding.

*DeLee-Greenhill Principles and Practices of Obstetrics, 8th Ed., p. 803, W. B. Saunders Co., 1943.

Write for comprehensive dosage chart and literature.

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Outside the Ivory Tower

OVERCROWDED classes in elementary schools and insistence on perfect attendance records are seen as hazards in guarding against rheumatic fever and rheumatic heart disease which have been called childhood's greatest enemy. Alertness by the teacher to early danger signals of poor health and understanding guidance of child and parent are recommended in a new booklet, "What the Classroom Teacher Should Know—and Do—about Children with Heart Disease," published by the American Heart Association and its affiliates. Crowded classrooms are listed among the bad environmental conditions that can lead to a "strep" infection, the "time bomb" that may be a forerunner of rheumatic fever. Although rheumatic fever itself is not catching, the preceding "strep" infection is. Teachers are therefore warned that preventing strep infections from spreading in the classroom may prevent some cases of rheumatic fever.

With many thousands of cases of rheumatic fever or rheumatic or congenital heart disease each year, and with rheumatic fever constituting the leading fatal disease between the ages of five and nineteen, the teacher is viewed as a valuable ally to doctor and parent in fighting this scourge of the younger generation. "No one but a physician can diagnose rheumatic fever," the Heart Association booklet points out. "But the teacher has a unique opportunity to help in rheumatic fever control through early detection of danger signals and prompt referral to the school health service."

WE received a lovely letter from our old friend, Dr. Hubert A. Royster, from Raleigh, North Carolina, who is one of our editors and a subscriber since 1905. We quote two paragraphs related to our Sixtieth Anniversary Number, July, 1951:

"I am particularly glad that you reprinted the paper of my beloved friend and Patron, Dr. Matas. I hear from him still, now and then. I am writing him now a word of felicitation. (Of course, the name of the hospital in his article should be the 'Hospital of the University of Pennsylvania' not the 'Pennsylvania Hospital.' That is at 8th and Spruce, the oldest in the United States and has no direct connection with the University.)

"Eakines' portrait (1889) is great. I know all the principals in it and some of the students (whose features are perfect). It was done two years before I registered there in October, 1891. It will be noticed that Agnew has the scalpel in his *left* hand, having done the cutting and turned to talk to the class while White finished the operation. Incidentally Agnew was *really* ambidextrous. I saw him two years later (just before he retired) demonstrate this talent in removing a fatty tumor of the shoulder. In the painting, in addition to J. William White (with glasses) are Edward Kirby, anesthetist, who was an instructor all through my time and Charles Leonard, leaning over patient's legs, who became one of the pioneer x-ray men in the country, later dying as so many did of cancer of hands and arms in that early time. (Pardon this ebullition.)"

HIGHER education seemingly hinders rather than helps the American girl's chances for romance that leads to matrimony. Among women at ages thirty-five to forty-four with less than seven years of schooling almost 95 per cent have been married at one time or other, whereas among those with more schooling the proportion married declines to 90 per cent for high school graduates and to 83 per cent for those with at least one year of college. Girls with higher education who do marry, the statisticians observe, acquire husbands with more schooling. Encouraging to marriage-minded girls is the finding that prospects for an early marriage, traditionally excellent for the average American girl, have become even brighter in recent years. The total number of married women in the United States has increased by some 8,000,000 since 1940, now standing at about 38,000,000.

The present total reflects the marriage boom of the war and immediate postwar years, the statisticians point out, and is a record high not only in absolute numbers but also percentage-wise to the adult population as well.

ENCOURAGING indications of a decline in cancer mortality are reported by statisticians of the Metropolitan Life Insurance Company, who base their findings upon the postwar experience of the company's millions

(continued on page 26)

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

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GREENSBORO, NORTH CAROLINA
WRITE TODAY FOR FREE CATALOG

Colostomy & Ileostomy Patients

find MORE Convenience and Longer Service with PERRY APPLIANCES

NEW 1950 MODEL

Convertible to use as Colostomy or Ileostomy appliance, Irrigator, or Protector. New unique method of cementing to the body (optional). Permits use of latex OR disposable plastic bags. *Write for folder showing complete line.*

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METACARPAL and THUMB FRACTURES

NEW TREATMENT NOW AVAILABLE

GOLDBERG METACARPAL SPLINT. A closed method of treating all types of Metacarpal Fractures including the Thumb.

Write for Literature and Reprints.

AMERICAN ORTHOPEDIC APPLIANCES
P. O. BOX 31 SPRINGFIELD, MASS.

STRYKER DERMATOME

New convenience in skin grafting! Cuts grafts in 2⅜" strips, any thickness, any length, from any part of body. Works most efficiently with Stryker Skin Tape. Sewing not ordinarily required. Motor and dermatome can be autoclaved as a unit. Quickly converted to bone saw.

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TRADE MARK OF QUALITY

SOLE MANUFACTURER OF
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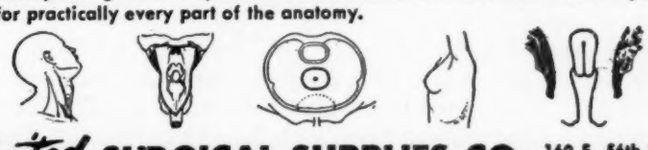
The Surgical Engineering Company, Inc.

ANATOMICAL RUBBER STAMPS

as designed and used by MEMORIAL HOSPITAL CENTER FOR CANCER and Allied Diseases and the Sloan-Kettering Institute for Cancer Research, New York and other leading hospitals.

Save printing costs of special forms. We have over 100 different stamps for practically every part of the anatomy.



***United* SURGICAL SUPPLIES CO.** 160 E. 56th Street New York 22 DEPT. M

Outside the Ivory Tower

(continued from page 24)

of industrial policyholders. Favorable developments in the cancer picture are most evident, the statisticians point out, when the recent trend of mortality is studied according to whether the primary site of the disease is accessible or inaccessible to diagnosis. For the accessible sites as a group, both men and women in the insurance experience recorded declines in the death rate from 1946 to 1947 to 1949 to 1950, men by 2.4 per cent and women by 7.2. There was a reduction in female mortality from almost all the accessible specific types of cancer. In the case of the inaccessible sites as a whole the death rate among women declined 1.1 per cent but, on the other hand, that among men showed an increase of 4 per cent. However, both sexes showed decreases for such specific sites as the stomach, intestines, other digestive organs, bladder and liver. Considerable increases in death rates were recorded for cancer of the lungs and other respiratory areas.

CANCER of the skin is 95 per cent curable when it is diagnosed and treated properly in its early stages, according to Cancer of the Skin, one of two pamphlets recently published by the Cancer Institute of the National Institutes of Health, Public Health Service, Federal Security Agency.

ENCOURAGING progress in the prevention of kidney stone formation was reported at a joint symposium of the American Chemical Society's Divisions of Colloid Chemistry and Physical and Inorganic Chemistry at Cornell University today. Injection into the human body of colloid chemicals designed to check kidney stones was described by Dr. Ernst A. Hauser, professor of colloid chemistry at the Massachusetts Institute of Technology, who carried on the research in cooperation with Arthur J. Butt, M.D., of Pensacola, Fla. Colloids are chemicals of extremely minute particle size. "This new approach to a very old medical problem is based on the scientific theory that kidney stone formation—the uninterrupted growth of crystals deposited in the kidneys—is averted in normal health by the presence in the urine of certain types of colloid," Professor Hauser said. He also declares that research covering several hundred medical cases, including both sexes and several racial groups, has indicated that the occurrence of kidney stones is most prevalent in individuals lacking these colloids in their urine. Up to this time no truly satisfactory cure or preventive therapy for this ailment has been developed, but attempts are now being made to prevent crystal growth by injecting the proper colloidal agents into the body.

DR. S. I. Griboff, senior medical student at Syracuse University College of Medicine when he enrolled in the competition, has been announced as the winner of the "Schering Award for 1950." Dr. Griboff is now serving his internship at Mt. Sinai Hospital, New York City. Mr. Francis C. Brown, president of Schering Corporation, presented the first prize of $1000 to Dr. Griboff for his paper on "The Clinical Use of Steroid Hormones in Cancer." Co-authors Robert W. Winters and Henry M. Williams, both third year students at Yale University of Medicine, were tied with Kenneth J. Ryan, third year student at the Harvard Medical School, for second prize and were awarded duplicate prizes of $500. Monte J. Meldman, third year student at Marquette University School of Medicine, was awarded the third prize of $300. Twenty-five contestants received honorable mention and each received special awards in acknowledgment of their contributions.

THE Faculty of the University of Paris Medical School is sponsoring an international contest among doctors and medical researchers working on a cure for splenomyelogenous leukemia. A prize of 2 million francs (approximately $5,700) will be awarded to the author or authors of an effective cure. Before a complete cure is found, part of the prize may be given for a piece of research which leads to substantial progress in the treatment of the disease. Dr. Léon Binet, Dean of the Paris Medical School, is chairman of the Committee that will evaluate the work submitted in the contest. Other members include Drs. Paul Chevallier, Maurice Lamy, André Lemaire and Jean Bernard, all members of the Faculty. Candidates for the prize, to be known as the "Prix Claude Justin," should send their papers to Dr. Léon Binet, 12 rue de l'Ecole de Médecine, Paris, 6.

(continued on page 28)

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When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

YOUNG'S DILATORS

Extremely useful in the treatment and prevention of contracted anus (particularly following hemorrhoidectomy), as an aid in perineal dissection and repair following delivery.

Sold only on prescription—at your surgical dealer or ethical pharmacy

Adult Set sizes 1, 1½, 2, 3—for stretching anal aphincter.
Children's Set sizes 0, 1, 1½, 2—for preventing contracted anus.
Size 3 and 4 drilled to take towel clamps—for use in perineal repair.

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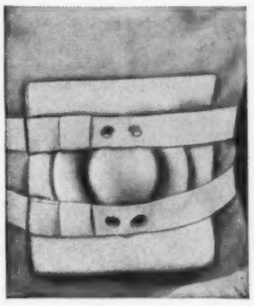
THE TRASK COLOSTOMY DOME, the appliance that uses the 33 ply cellucotton disposable receiving pad. A new fresh pad after each movement keeps the patient immaculate at all times.



NOTHING TO WASH

Sold at all leading surgical supply houses.....$10.50

If your dealer cannot supply your patients, order direct but be sure to mention your dealer's name.

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"Pressoplast"

Natural or Flesh Colored
Adhesive Cotton E-L-A-S-T-I-C Bandage

"Contura"—**BANDAGE**

skin protecting medicated

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SPONGE BIOPSY FOR CANCER DIAGNOSIS

(Method of Dr. S. A. Gladstone)

Sponge Biopsy is simple, rapid, painless, reliable. Sponge Biopsy facilitates diagnosis in the early curable stage of cancer of the cervix uteri,* rectum, oral cavity, skin, etc. Sponge Biopsy has received awards at the Scientific Exhibits of the N. Y. State Medical Society and the American Medical Association.

For best results use Onkosponge No. 1 and Gladstone Sponge Biopsy Forceps, prepared and designed especially for Sponge Biopsy.

Write for descriptive leaflet and reprints.

* Ref. Am. J. Surg., March, 1951.
J.A.M.A. April 21, 1951 p. 1238

HISTOMED, INC.
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FRACTURE EQUIPMENT

Ask your Dealer to show you RAJOWALT fracture equipment catalog

It will save you money

IMMEDIATE DELIVERY

Sold only through Surgical Dealers

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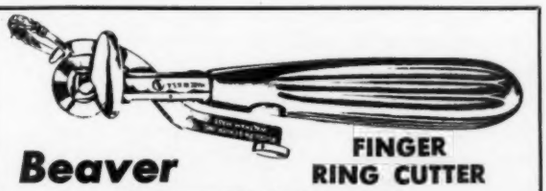

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Removes Ring in 4 Seconds

Failure to get a ring off in a hurry can lead to tragic results. Every first aid room needs this inexpensive, easy to use instrument. Just slip lever under ring and turn thumb screw. Ring is cleanly cut in 4 seconds. Extra saws, always in stock, are 85¢.

Price $9.00 Complete

Rudolph Beaver Co. **Waltham 54, Mass.**

STRYKER Portable Suspension Traction Frame

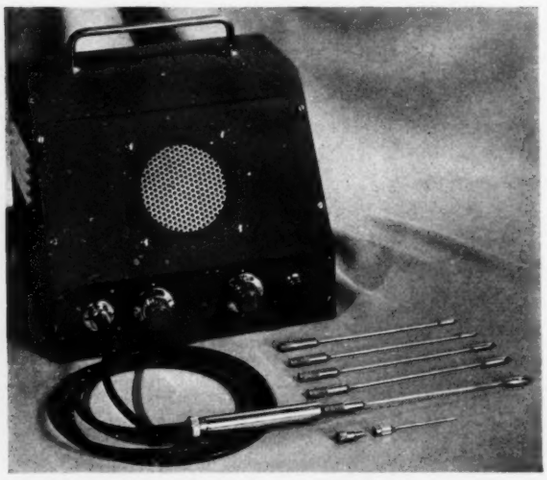
For fractures of the femur in infants and children. Designed for Bryant traction and to simplify reduction. Fully adjustable for children up to seven years. Child can be taken home several weeks earlier.

ORTHOPEDIC FRAME COMPANY
Kalamazoo, Michigan

Outside the Ivory Tower

(*continued from page 26*)

THE Kirby-Thurston Electro-Acoustic Locator, distributed exclusively by George P. Pilling & Son Co. of Philadelphia, is an electro-acoustic device for the location of hard objects in the human body. Originally designed for the location of gallstones, its field of usefulness has been widened to include the location of any hard foreign body, such as metal, stone or bone fragments, in muscle or tissue, or in body cavities. The principle of operation of the Locator is very simple. It is essentially a device which responds to the tiny shock produced when the probe touches a hard object in a manner quite similar to that of a phonograph pickup when the needle traverses the grooves in a record. The slight vibrations caused by contact with a stone or other solid material travel along the probe and are transmitted to the highly sensitive pickup element. The pickup element transforms the vibrations into a voltage which is amplified and made to operate the loudspeaker which emits a characteristic and easily recognizable click.



Several outstanding innovations are presented. A special circuit eliminates extraneous contact noises, removing the possibility of false identification. The entire pickup unit and cord may be sterilized by autoclaving. The Locator is light, compact and comparatively inexpensive.

THE American Council of Christian Churches reaffirms its resolution of April, 1949, against socialized medicine. Freedom of the individual, freedom of the doctor and freedom of medical research are essential to the preservation of a free society. We are aware of the fact that among the clergy and in certain church groups there is increasing pressure for government socialism beginning with socialized medicine. The leadership of Methodist Pink Bishop G. Bromley Oxnam on the committee for the nation's health spearheading this drive is only a part of the over-all program to socialize the entire world under the guise of establishing the Kingdom of God. The tyranny, abuse, corruption, confusion, demoralization and irresponsibility attendant upon any effort to make the state responsible for a person's health will be a valid judgment of the Almighty God upon those who lightly esteem their God-given freedom. No state can assume either the responsibility which belongs to an individual or the prerogatives which belong to God Almighty. Christian people must expose and resist the campaign now being waged for socialized medicine. These appeals actually are based upon the lowest motives, including the offer of something for nothing in order to win votes.

FOUR members of the faculty of Northwestern University's Medical School have been appointed Abbott Professors for the academic year 1951 to 1952. The four men will engage in medical research made possible by a $1,500,000 gift Northwestern received in 1939 from the estate of the late Clara A. Abbott, widow of Dr. Wallace C. Abbott, founder of Abbott Laboratories in North Chicago. Named Abbott Professors were Dr. Carl Dragstedt, professor and chairman of the Department of Pharmacology; Dr. Henry Bull, professor in the Department of Chemistry; Dr. Fred Grodins, professor in the Department of Physiology and Dr. E. Albert Zeller, associate professor in the Department of Chemistry.

TREATMENT of the alcoholic patient involves treatment of his family and his environment as well, Dr. Fritz Kant, neuropsychiatrist at the University of Wisconsin, told the Summer Session of Alcohol Studies meeting on the Madison campus. Causes of the neuroses which drive him to drink may go back to childhood and must be dug out and examined before effective therapy can begin, he advised the educators, churchmen and social workers attending the conference.

"Even after the neuroses have been cured, the battle against alcoholism must go on. It is a lifelong fight that calls for persistence and consistence," he added.

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list

"MY COLOSTOMY"

A Regimen for Successful Colostomy Irrigation and Patient Adjustment

A beautifully printed, 16 page booklet, accepted by surgeons as an aid to instruction; including literature on the Triple Purpose Shield. A shield which insures a clean irrigation, using a plain catheter.

Sent Postpaid, by Request

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INFORM CONTROLS

An aid in Control of *INFANT DIARRHEA*

Assure production of bacteriologically acceptable formula.

Designed for use where terminal autoclaving (230°—10 minute technique) is employed.

WRITE FOR FREE SAMPLES.

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1847 North Main, Royal Oak, Michigan
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Close-Up of Eye Taken with Kine Exakta "V" Camera.

For Parallax-Free Surgical Photography!

KINE EXAKTA "V"

35 mm Single Lens Reflex Camera

The Kine Exakta, with both regular and telephoto lenses, is widely used in hospitals for operation room photography. Its unique through-the-lens viewing system assures absolutely correct "on the subject" photographs during every step of the operation. In addition, this world famous medical camera is regularly used for preliminary, developmental, and end result pictures of patients; for copying X-Rays; and for making color transparencies of injuries and lesions —a necessity for recording and lecturing.

With f3.5 Zeiss Tessar "T" Coated Lens	$180.00*
Penta-Prism Eye Level Reflex Viewfinder	60.00*
Extension Tube Set	24.00
Microscope Adapter	29.50

* plus tax

Write Dept. 500 for free descriptive booklet "E" on camera and accessories and brochure on close-up technique with the Kine Exakta.

EXAKTA CAMERA CO., 46 W. 29th St., N. Y. 1, N. Y.
Exclusive Sales and Service Organization in the U.S.A. for Ihagee Camera Works, Germany

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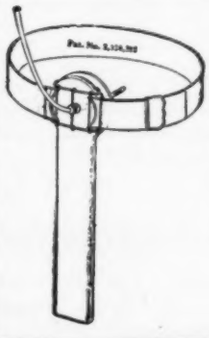

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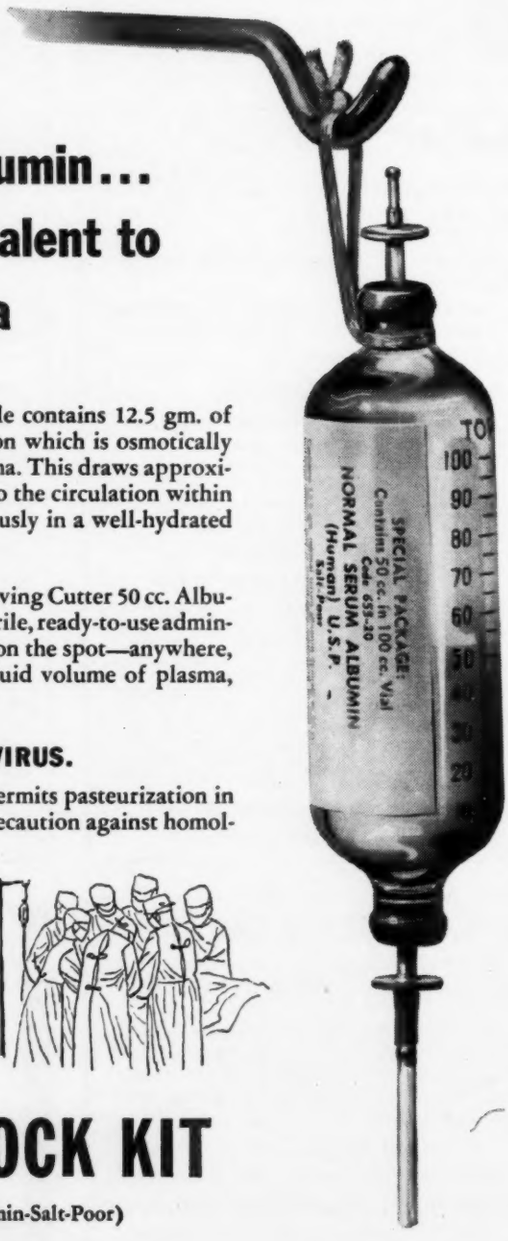

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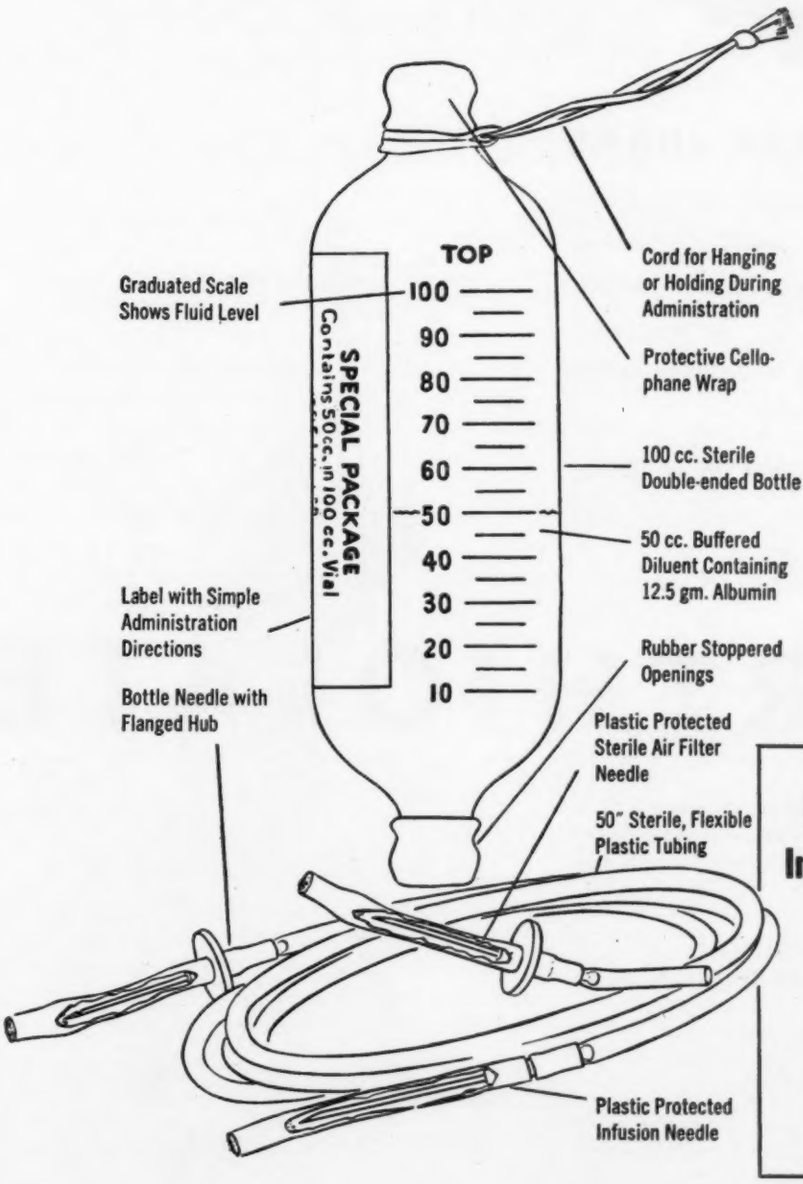

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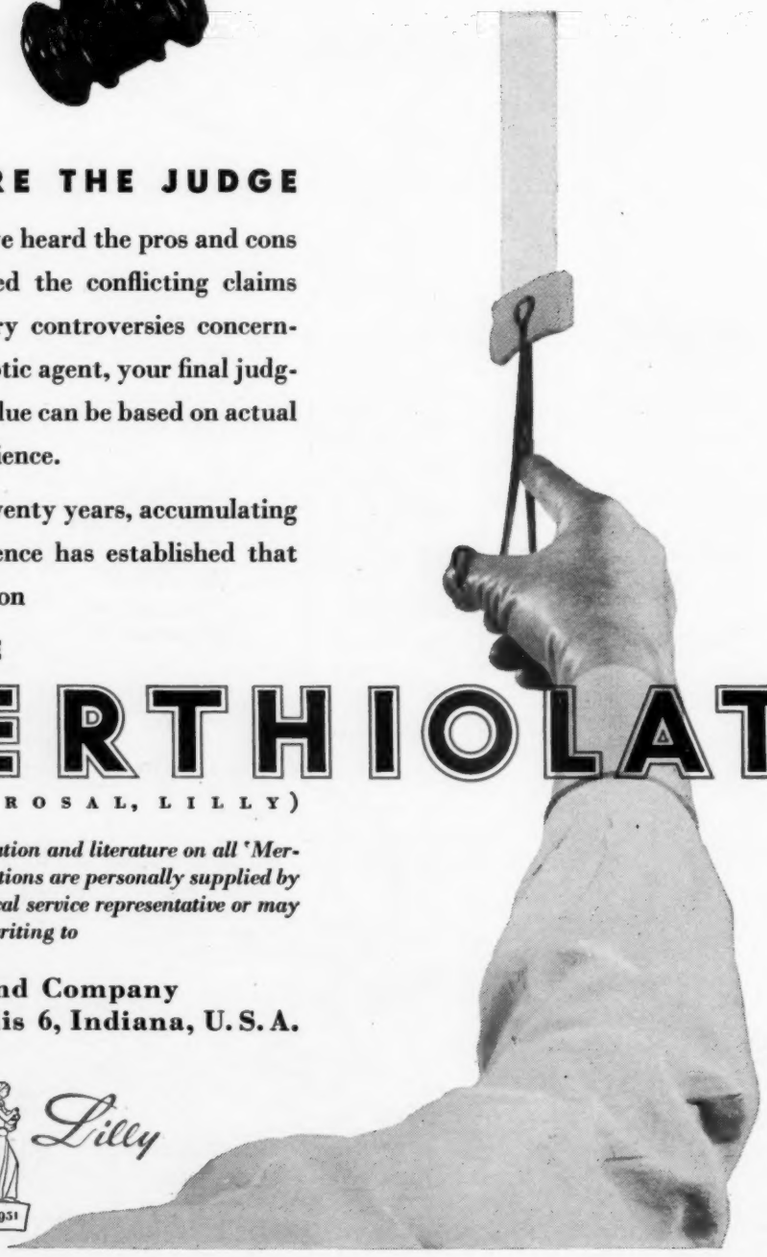

The American Journal of Surgery

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A PRACTICAL JOURNAL BUILT ON MERIT

Sixtieth Year of Publication

VOL. LXXXII SEPTEMBER, 1951 NUMBER THREE

Editorial

MULTIPLE PRIMARY MALIGNANCIES

IN the past year we have noted the occurence of multiple primary cancers in several patients. The occurrence of more than one primary cancer in the same individual is no longer a medical curiosity. Surgical literature[1] reveals that up to 1932, 1,259 cases have been reported. These lesions have been known to group themselves in organs that are a part of the same anatomic system but they are occasionally found in sites that have no systemic relationship. It is interesting that despite the tremendous advance in cancer research since Billroth[2] first reported the occurrence of multiple primary malignant neoplastic disease the true biologic significance of this condition remains obscure.

Warren and Gates[1] performed 2,829 autopsies on patients with cancer and found 194 instances of multiple primary malignant growths, an incidence of 6.8 per cent. Based on this datum they concluded that an individual with one cancer is more apt to have a second cancer develop than would be expected by chance alone. This tendency was considered to be eleven times greater in such individuals than in those who had never had cancer. The authors also stated that an average interval of 3.2 years elapsed between the appearance of the individual neoplasms when this could be measured. The incidence of multiple primary malignant neoplasms has been variously reported between 0.3 and 6.8 per cent of all cancer cases. The percentage rate of these tumors with their sources in the literature follows: Second Budapest Pathological Hospital,[4] 0.3 per cent; University of Milan,[4] 0.5 per cent; Erisman General Hospital, Leningrad,[4] 1.87 per cent; Schreiner and Wehr,[5] 2.7 per cent; Hurt and Broders,[6] 3.34 per cent; Lichtman,[7] 3.50 per cent; Warren and Gates,[1] 3.70 per cent; Stalker, Phillips and Pemberton,[8] 4.52 per cent; Berson and Berger,[9] 4.60 per cent; Owen,[10] 4.70 per cent; Warren,[11]

[1] WARREN, S. and GATES, O. Multiple primary malignant tumors. A survey of the literature and a statistical study. *Am. J. Cancer*, 16: 1358–1414, 1932.

[2] BILLROTH. Quoted by Bargen and Rankin.

[3] BUGHER, J. C. Probability of chance occurrence of multiple malignant neoplasms. *Am. J. Cancer*, 21: 809–824, 1934.

[4] BURKE, M. Multiple primary cancers. *Am. J. Cancer*, 27: 316–325, 1936.

[5] SCHREINER, B. F. and WEHR, W. H. Multiple primary cancer as observed at State Institute for Study of Malignant Disease. *Am. J. Cancer*, 20: 418–424, 1934.

[6] HURT, H. and BRODERS, A. C. Multiple primary malignant neoplasms. *J. Lab. & Clin. Med.*, 18: 765–777, 1933.

[7] LICHTMAN, A. L. Multiple primary malignant lesions. *Proc. Staff Meet., Mayo Clin.*, 19: 317–323, 1944.

[8] STALKER, L. K., PHILLIPS, R. B. and PEMBERTON, J. D. Multiple primary malignant lesions. *Surg., Gynec. & Obst.*, 68: 595–602, 1939.

[9] BERSON, H. L. and BERGER, L. Multiple carcinomas of large intestine. *Surg., Gynec. & Obst.*, 80: 75–84, 1945.

[10] OWEN, L. J. *J. A. M. A.*, 76: 1329–1333, 1921.

[11] WARREN, S. Multiple cancers of human gastrointestinal tract. *J. Nat. Cancer Inst.*, 5: 375, 1945.

6.00 per cent; Warren and Ehrenreich,[12] 6.8 per cent; United States Average,[1] 3.90 per cent; and Combined European and United States Average,[1] 1.84 per cent.

If it is true that there is a tendency for the development of carcinoma in certain individuals, it naturally follows that as survival rates are extended by a combination of improved methods of diagnosis and treatment new cancers can be expected to arise in new sites. Therefore, the follow-up of a patient with cancer is important not only to determine the results of treatment but also to enable a search for new growths.

Multiple primary malignancy in one individual may occur either simultaneously (synchronous) or at different times (metachronous). When Billroth[2] first reported his work, he stipulated three rules by which multiple individual malignancies could be identified: (1) The two growths must show distinct histologic differences so as to exclude the possibility that they are of the same origin. (2) Each lesion must spring from its parent epithelium. (3) Each lesion must be held responsible for its own group of metastatic growths.

Since Billroth's time the literature has become extensive. In 1888 Fenger[13] reported a case of double carcinoma of the colon in a significant article. Major[14] in 1918 reviewed the literature on all multiple malignancies from 1889 to 1918. Although he reported 628 cases, there were none of the colon. Dowden[15] in 1917 reported a case of a patient with four malignancies of the colon, all within six years. Cabot[16] recorded a case of carcinoma of the cecum which was removed and was followed in ten years by the appearance of a carcinoma at the splenic flexure.

In our opinion the criteria which Billroth[2] has postulated are too rigid. We believe it is possible for two primary lesions of the same pathologic type to occur in the same or different systems and yet show similar pathologic cytology. The potential combinations of primary malignant tumors are numerous, but Slaughter[17] has shown in his analysis of 1,868 cases that there is a striking tendency for them to occur in the same organ or in paired organs (54.3 per cent). This observation has also been made by Lichtman,[7] and Stalker, Phillips and Pemberton.[8] Ewing[18] reported that bilateral primary carcinoma of the breasts occurs in 1.5 per cent of the cases. According to the literature multiple primary neoplasms occur most frequently in the skin or in combinations with the skin. This group constitutes more than 50 per cent of the cases in many of the earlier reports. As Slaughter[17] points out, the fact that the skin is the system most frequently involved is not surprising when one considers the relative size of this organ and the frequency with which it is exposed to external chemical and physical carcinogenic stimuli. Schreiner and Wehr[5] observed that basal cell carcinoma is found more frequently than squamous cell carcinoma in multiple primary tumors involving the skin.

The next most commonly involved system is the gastrointestinal tract, followed by the genitourinary system. According to Slaughter's[17] work, the order of frequency of involvement of the several divisions of the gastrointestinal tract is (1) the colon, (2) combinations of colon and stomach and (3) the stomach which, as he points out, is somewhat of a surprise as gastric carcinoma is not generally thought of as being multiple. As would be expected, the highest incidence in the paired organs occurs in the breast, ovaries, testicles and kidneys, in that order. Multiple primary tumors involving two different systems occur most frequently in the gastrointestinal and genitourinary systems. Second in frequency are tumors involving the breasts and genitourinary tract. Multiple sarcomas are relatively rare: however, combinations of carcinoma and sarcoma are not infrequent.

Certain combinations, particularly those involving the same tissue or same organ, are frequently difficult to prove because of the problem of excluding metastasis. Examples of these are multiple primary lesions confined to the ovaries, breasts, skin, colon, and combinations involving the ovaries and gastrointestinal tract

[12] Warren, S. and Ehrenreich, T. Multiple primary malignant tumors and susceptibility to cancer. *Cancer Research*, 4: 554–570, 1944.

[13] Fenger, C. *J. A. M. A.*, 11: 606, 1888.

[14] Major, R. H. *Johns Hopkins Hosp. Bull.*, 29: 223, 1918.

[15] Dowden, J. W. *Edinburgh M. J.*, 19: 181, 1917.

[16] Cabot, R. C. *Boston M. & S. J.*, 195: 906, 1925.

[17] Slaughter, D. P. Multiplicity of origin of malignant tumors; collective review. *Internat. Abstr. Surg.* 79: 89–98, 1944; in *Surg., Gynec. & Obst.*, 1944.

[18] Ewing, J. Neoplastic Diseases; A Treatise on Tumors. 4th ed. Philadelphia, 1940. W. B. Saunders Co.

(Kruckenberg). Teratomas also give rise to doubt in certain cases.

In conclusion, a review of the literature dealing with the problem of multiple primary malignant lesions has been presented. The criteria for the establishment of such a diagnosis have been considered. Certainly, according to statistics, it is obvious that as our diagnostic acumen is increased and the patient with carcinoma is operated upon much earlier, the chances for a second lesion, either at the time of operation or subsequently, must be carefully considered. We strongly urge that a more careful exploration be carried out at time of operation and, certainly, a careful follow-up of all patients with carcinoma is important.

HYMEN D. STEIN, M.D. AND
ALBERT BEHREND, M.D.

DR. ROBERT L. FAULKNER of Cleveland, Ohio, has been elected Secretary-Treasurer of the American Board of Obstetrics and Gynecology. Dr. Faulkner succeeds the late Dr. Paul Titus, who had been Secretary-Treasurer of the Board since its inception twenty-one years ago. Dr. Lawrence M. Randall of Rochester, Minnesota, has been elected to the position of Assistant Secretary; Dr. Herbert E. Schmitz of Chicago, Illinois, has been elected a Director of the Board.

Effective August 10, 1951, the office of the Board will be located at 2105 Adelbert Road, Cleveland 6, Ohio. All correspondence with the Board should be sent to Dr. Faulkner at this address.

Original Articles

STUDIES IN WARTIME ANESTHESIA*

RICHARD FOREGGER, M.D.†
Milwaukee, Wisconsin

THE following studies of anesthesia during World War II are based upon the experiences of the author as a member of an Auxiliary Surgical Group. Membership in such an organization enabled him to serve in several types of army hospitals, first in England before the invasion and later in Europe.

I. EXPERIENCES IN A MILITARY HOSPITAL IN ENGLAND

The U. S. Medical Corps in England in 1943 consisted mainly of a few station and general hospitals designed to service static troops of the Army Service Forces and combat troops of the Army Air Forces. The airfields of the Eighth Air Force Bomber Command were situated in Eastern and Southern England and six hospitals were located within convenient distance by ambulance to them. Medical officers of the Auxiliary Surgical Group served as a reserve pool and anesthetists were sent, on recommendation of the theatre consultant in anesthesia, to work in American and British hospitals where they were needed.

Surgery in these hospitals was of two types: (1) Elective surgery consisted of the ordinary operations performed on garrison troops and reparative operations on the previously wounded. Fifty-two non-traumatic operations which were performed outside the scheduled operating hours were included in this category. (2) Traumatic surgery consisted of operations resulting from accidents incident to army life and from injuries sustained in combat during the bomber raids on the continent.

The anesthesia department of the station and general hospitals was considered a section of the surgical service. The writer was sent to a station hospital in the summer of 1943 as chief anesthetist. This hospital consisted of 750 beds evenly divided between medical and surgical services. The entire hospital, both patients and staff, was housed in Quonset huts. All the surgical beds were located conveniently close to the operating rooms. There were two operating rooms, each containing two operating tables. The operating rooms were located inconveniently, one on each side of the Quonset hut, so that if operations were going on in each room at the same time it required a good deal of sprinting for the anesthetist to cover both rooms. In the beginning there were no other medical officers assigned to duty in the anesthesia section. This required that the one anesthetist in addition to a busy daytime schedule had to take care of all emergency anesthetics at night. A second anesthetist was soon added to assist with the work. In addition to the duties in the operating rooms anesthetists in this hospital visited each patient preoperatively and postoperatively. On the preoperative visit the patient's condition was ascertained and the preoperative medication was ordered. This usually consisted of morphine and atropine; but if the patient was to receive local, regional or spinal analgesia, nembutal® was given in addition. On the postoperative visit the patient's condition was noted; and if there were any complications attributable to the administration of the anesthetic, the proper treatment was carried out. The anesthetic section was also charged with the maintenance of the oxygen therapy equipment in the hospital. The administration of oxygen therapy was, however, carried out usually by the ward medical officers and nurses. The anesthetists were responsible only for the maintenance of the anesthesia equipment in the operating theaters. The procurement and maintenance of all other equipment in the operating section

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was the responsibility of the chief surgical nurse. This system was efficient.

On the days when battle casualties were expected from the bomber raids all personnel of the surgical service were alerted in time to be ready. Usually these casualties arrived late in the afternoon or in the evening after the regular day's work was finished. They were all brought to one room adjacent to both the radiology department and operating theater and left on stretchers until their conditions could be properly ascertained. Those who were not seriously wounded were sent to the ward or to the operating room if their presence there would not divert needed personnel from the care of the seriously wounded. The seriously wounded were treated by means of infusions of plasma and blood for shock by medical officers detailed to that duty. There was no bank blood available at that time and the procurement of blood for transfusions was in the hands of a special service in the hospital. At these times the anesthetists were kept busy in the operating rooms but it was possible during a lull to visit the shock room in order to gain some knowledge of the patients who were coming to operation. At times the anesthetist was required on the shock ward in order to perform endotracheal intubation on the wounded patients with respiratory obstruction. Suction was conveniently on hand for removing accumulated secretions or blood from the trachea. For this purpose the army supplied each operating room with a small portable suction outfit.

Anesthesia

Equipment and Supplies. The anesthetic equipment in this particular hospital consisted of two field type portable Heidbrink machines and one portable McKesson machine. Gas mask tubing was used in place of the corrugated rubber breathing tubes which could not be obtained. This served well but was a little short. Large G cylinders of oxygen and nitrous oxide were connected to the machines by means of high pressure rubber tubing. The fourth operating room table had no gas machine. In addition, the army supplied a number of portable anesthesia outfits. This set of accessories contained airways, Gwathmey-Yankauer mask, needles, syringes, blood pressure apparatus and stethoscope and complete endotracheal equipment. Each station and general hospital received three or four of these and a small compact local anesthesia set which was a British product but was supplied to American hospitals. This was an excellent bit of equipment containing the British-manufactured Lundy syringe and very fine quality needles to go with it. Syringes and needles for intravenous anesthesia were plentiful as were the supplies of pentothal.® The army supplied 1 gm. ampuls of pentothal® with 50 cc. ampuls of distilled water. For local and regional anesthesia purposes 5 cc. ampuls of 20 per cent solution of metycaine were available. Pontocaine solution, 1 per cent in 2 cc. ampuls was available for spinal anesthesia and this was sometimes mixed with procaine crystals according to the method of Tovell.[1] Metycaine solution, 10 per cent in 2 cc. ampuls, was also available for spinal analgesia. For inhalation anesthesia, oxygen, nitrous oxide, ether and ethyl chloride were obtainable. Cylinders of oxygen and nitrous oxide were supplied from British sources.

Type of Anesthesia. All anesthetics administered either by the writer or associates temporarily attached to the department were recorded on the Nosworthy anesthesia record.[2] It was necessary also to maintain a very brief chart of the course of the anesthesia for the army which was included in the soldier's medical record. A report of the departmental work was compiled once a month and submitted to the office of the chief surgeon. The following tables were compiled solely from the Nosworthy records and represented only the patients which were personally anesthetized during a period of three months in one station hospital. An equal number of anesthetics of similar type was administered by the assistant anesthetist. A few anesthetics were administered by occasional anesthetists assigned to the department for a short time or by ward officers pressed into anesthesia service during peak activity. A large number of minor surgical procedures were performed under local anesthesia administered by the surgeon thus relieving the anesthetists for other cases.

Table 1 shows the type of anesthetic given for elective surgery correlated with the type of operation in 202 cases. One of the first things that strikes the reader is the large number of operations performed with regional anesthesia, especially operations of extremities and the perineum. This may be attributed to the fact

that an attempt was being made to evaluate this form of anesthesia for future combat use and to improve technics. The second point is that one-half of the cases shown in Table I were done with spinal analgesia (spinal and spinal with intravenous.) Spinal analgesia saved time. Many of the husky, healthy soldiers who might have been difficult to subdue with general anesthesia were thus quickly and easily anesthetized. Unconsciousness was deliberately induced in seventeen of the spinal analgesia cases with pentothal® sodium intravenously either to eliminate disturbing sensations from traction or because the patient desired unconsciousness.

Table II shows the types of anesthesia used for traumatic surgery. Most of these cases were battle casualties. A small number were due to accidents incident to army life (jeep accidents, propeller blows, drunken soldiers falling, etc.). The table shows that most of the injuries were to the extremities. The use of regional anesthesia for traumatic extremity operations was less than for elective extremity operations. The incidence of spinal analgesia in traumatic operations was reduced from that employed in elective extremity operations. Most of these operations were extensive and required intervention on deeply situated structures. They were therefore very painful. Some

TABLE I

ANESTHESIA FOR ELECTIVE SURGERY

Site of Operation	Total	Regional	Spinal	Spinal-Intravenous	Intravenous	Ethyl Chloride-Ether	N_2O-Ether	N_2O-Intravenous
Extremities	38 19%*	14 37%	6 16%		11 29%		6 16%	1 2%
Perineal and genito-urinary	67 33%	36 54%	21† 31%		7 10%			3 4%
Inguinal	25 13%	3 12%	15 60%	4 16%	2 8%		1 4%	
Lower laparotomy	46 23%		35‡ 76%	10 22%		1 2%		
Upper laparotomy	7 3%			3		4§		
Body wall	10 5%	1	7		1		1	
Other head and neck	4 2%	1			2		1	
Mouth, nose and throat	5 2%	1			2	1	1	
Total	202 100%	56 28%	84 42%	17 8%	25 12%	6 3%	10 5%	4 2%

*The percentages are for aid in interpretation of the data. Those given under the total are percentages of the grand total, 202. For example, 19% of the operations performed were on extremities. Of the 38 operations on the extremities, 37% were performed under regional, 16% under spinal, 29% under intravenous, etc. Of the total cases, 202, 28% were performed under regional, 42% under spinal, 8% under spinal with intravenous, 12% under intravenous, etc. No percentages are given where small numbers of cases are listed because of the lack of significance of a few cases.

†One spinal supplemented with pentothal and ether by absorption because of length of operation.

‡One spinal supplemented by intravenous pentothal and ether by absorption.

§Plus satisfactory abdominal block for one.

were multiple operations. Some soldiers who had been in combat over enemy territory all day long were under nervous tension. For these reasons unconsciousness and relief of pain were produced with general rather than with regional or spinal anesthesia. Spinal anesthesia was not employed because many of these patients were undergoing therapy for shock.

TABLE II

ANESTHESIA FOR TRAUMATIC SURGERY

Site of Operation	Total	Regional	Spinal	Intravenous	Intravenous-N_2O	N_2O-Ether	Ethyl Chloride-Ether
Extremities	61 84%*	18 30%	4† 6 5%	15 24.5%	15 24.5%	9 14.5%	
Perineal and genitourinary							
Inguinal							
Lower laparotomy	2		1				1
Upper laparotomy	1						1‡
Body wall	4			2	1	1§	
Other head and neck	3			3			
Mouth, nose and throat	1			1			
Brain and spinal cord	1			1			
Total	73 100%	18 25%	5 7%	22 30%	16 22%	10 13.5%	2 2.5%

*Interpretation of percentages is the same as for Table I.

†One spinal followed with intravenous pentothal because of length of operation.

‡Plus satisfactory rectus block.

§Local followed with N_2O-ether when local failed.

A breakdown of the eighteen regional anesthetics administered for traumatic surgery reveals that fifteen of these were brachial plexus blocks. Four of these brachial plexus blocks were considered unsatisfactory. The criteria were strict. Any patient who had any pain whatsoever was considered to have an unsatisfactory anesthetic as it had not fulfilled its purpose of pain relief despite the fact that the operation may have been carried out successfully without supplementation. One patient had pain but required no supplement. Another patient had pain and required a local anesthetic by the surgeon even though the patient had paresthesias of the ulnar, median and long thoracic nerves during injection. In addition, two brachial plexus blocks were considered unsatisfactory because of repeated vomiting. One of these patients required two procaine injections of the brachial plexus within a period of two hours and he vomited following each injection. The other vomited only once following the first injection. In each case 50 cc. of 1 per cent procaine were used for each injection. The other three regional anesthetics for traumatic surgery included an anterior and posterior tibial block, a wrist block and an ulnar nerve block, all of which were satisfactory.

Of the fifty-six regional anesthetics employed for elective surgery thirteen were considered unsatisfactory. The cause of the failure of a block was not always apparent. A few were due to inept technical administration. Some patients had pain despite an apparently perfect administration, including paresthesias in each nerve injected. One was considered a failure

because of intense pain during bone manipulation, a very difficult procedure for which to anesthetize by the brachial plexus block in the author's experience. Another was a failure because of anatomic distortion of the landmarks. In one instance a brachial plexus block required that the patient be made unconscious because of unexplained intense pain in the chest. Despite the large number of unsatisfactory brachial plexus blocks this form of anesthesia on occasion is gratifying as the following case will reveal:

Lieut. C. H., a bombardier, was wounded by anti-aircraft shell fragments. He received a penetrating wound of the left forearm with fracture of the radius and ulna and a penetrating wound of the right arm and right forearm. Left brachial plexus block was performed using 100 cc. of 1 per cent procaine. Within five minures he was quiet until an hour later at which time the left brachial plexus was injected again with 60 cc. of procaine. Following the completion of débridement and manipulation of the left forearm the right brachial plexus was injected with 80 cc. of procaine. The right arm and forearm were débrided without pain.

Although the use of brachial plexus block in this type of case is appealing, there is no doubt but that other forms of anesthesia could be used with equal success. The successful use of regional anesthesia in isolated cases does not convince the writer that the method would have widespread application to injured soldiers. The near failures and high incidence of unsatisfactory blocks are indications that more certain methods must be used when large numbers of severely wounded men are anesthetized.

Misuse of Local Anesthesia. The following case will illustrate the misuse of local anesthesia for a severe injury:

S/Sgt. E. M., aged twenty-six, a gunner, received a penetrating wound of the left lumbar region during an operational flight over Germany at 20,000 feet. He was apprehensive and feared that the wound had involved the abdominal cavity. It was proposed to explore the wound under local anesthesia. Accordingly the wound edges were injected with 1 per cent procaine. During the exploration of the lumbar wound the patient experienced much pain and begged to be put to sleep stating that he could stand no more after what he had been through during the day. After an unsuccessful attempt at exploration anesthesia was induced with pentothal® in the now highly excited patient. He was in moderate shock at this time, with pulse rate of 140 per minute and cold, wet, pallid skin. Anesthesia was maintained with light nitrous oxide–ether anesthesia for an hour during which time the surgeon explored and débrided the large flank wound completely. Postoperatively there was much pain in the wound and atelectasis developed on the second day. This was relieved by the patient coughing up the large plugs and he made a slow but uneventful recovery during the next two weeks.

In order to be spared general anesthesia this patient was subjected to the ordeal of a painful operation under inadequate local anesthesia which precipitated shock and finally necessitated the use of general anesthesia. Local anesthesia is reserved for local operations. Extensive operations require complete anesthesia of the body, usually with unconsciousness in the wounded soldier. The severely wounded soldier desires unconsciousness not only because regional anesthesia is frequently inadequate to block out completely the sensations arising from the operative site, but also because he has gone through an experience which makes him demand unconsciousness.

Inhalation Technics. If the various inhalation technics are correlated with the inhalation agents, it is found that the carbon dioxide absorption technic was used most frequently. Nitrous oxide was administered most often for induction. Of this series of forty-eight cases endotracheal intubation was employed twelve times.

Respiratory Complications. A study of the incidence of major and minor respiratory complications following these 275 operations shows that minor respiratory complications developed in twenty-two patients. Of these twenty-two patients five had received intravenous pentothal,® twelve had spinal anesthesia, four had regional anesthesia and one had received nitrous oxide followed with ether. Minor respiratory complications were upper respiratory infections, cough, mild bronchitis or exaggeration of any of these existing before operation. Seventeen of the twenty-two minor respiratory complications had minor preoperative respiratory complications. The major respiratory complication was atelectasis. Of the six patients in whom atelectasis developed three had minor respiratory complications preoperatively and one had a gunshot wound through

the lumbar area. This patient had inadequate local anesthesia followed with nitrous oxide–ether when he could no longer stand the pain. Seventy-four patients had minor respiratory complications preoperatively without developing postoperative exaggeration. One case had major respiratory complication preoperatively, i.e., hemothorax, without developing postoperative exaggeration.

Headache. Thirty-three patients or 12 per cent reported headaches following all forms of anesthesia in 275 operations. Four of these patients had preoperative headaches which were not exaggerated by anesthesia or operation. Twenty-seven per cent of the patients who received spinal–intravenous pentothal® anesthesia, 14.9 per cent of those who received intravenous pentothal,® 15.7 per cent of those who received spinal, 12.5 per cent of those who received ethyl chloride–ether and 6.8 per cent of those who received regional anesthetics reported postoperative headaches. Although the incidence of headache was greatest following spinal combined with intravenous anesthesia, the small number of cases in most groups precludes definite conclusions.

Vomiting. Thirty-two patients from the entire series of 275 vomited postoperatively. A breakdown of this small number would not be significant. Fifteen patients of the entire series of 275 vomited on the operating table. The eleven patients undergoing elective surgery who vomited during the operation received spinal analgesia. No postoperative complications were noted. Four patients of the traumatic group vomited during the operation. All four had food in the stomach. Three patients received regional anesthesia and were conscious so that they were able to expel the vomitus and they presented no problem. The fourth patient of this group was anesthetized on two different occasions and vomited each time. Both events are of interest. The patient was a twenty year old rear gunner who was struck by a rocket shell at 28,000 feet over Schweinfurt. He suffered a hugh avulsion of the buttocks, maceration of the right thigh, compound fracture of the right femur and penetrating lacerating wounds of the left thigh. He was in severe hemorrhagic shock on admission, with a hemoglobin of 51 per cent and a red blood cell count of 1,870,000. He was treated for five hours with blood and plasma for the shock. Induction of anesthesia was with 400 mg. of pentothal® very slowly after which he vomited black, foul, granular fluid. He was turned into the prone position in order to facilitate the emptying of the mouth and throat. After vomiting had ended he was given more pentothal® supplemented with nitrous oxide and the operation was performed. Operation required an hour and a half after which he awakened immediately, drank a glassful of water and was sent to the ward. Thirty-six hours later he had his stomach washed to relieve persistent hiccoughs. Two days after the first operation he was brought to the operating room for amputation of the right thigh in which gas gangrene had developed. Anesthesia was induced with 1 gm. of pentothal® slowly after which he was turned prone. He began to vomit. The vomitus was removed with suction and the operation begun. However, the patient had recurring episodes of vomiting for the next thirty minutes. The vomitus appeared in the mouth and throat, apparently without any active muscular effort on the part of the patient. At the end of thirty minutes endotracheal intubaion was performed. Suction was used with much improvement. At the end of the operation the patient was turned supine and thorough tracheal aspiration was again peiformed. No postoperative complications developed. The writer has dwelt on vomiting of patients with food in the stomach as the subject loomed large in the latter part of the war when hundreds of thousands of such soldiers were anesthetized. Preoperative gastric lavage in the emergency wounded soldier was not practiced in this hospital.

Death. There was one death in this series of 275 cases. The patient was a twenty-five year old soldier who was suffering from perforated gastric ulcer of thirty-six hours' duration. Surgery required one hour during which the perforation was sutured. Anesthesia was with ethyl chloride–ether sequence followed with abdominal wall block using 60 cc. of 1 per cent procaine. There were no operative complications. The patient died forty-eight hours after operation and autopsy revealed diffuse purulent peritonitis.

Army Education and Training in Anesthesia. The chief surgeon had a group of officers attached to his office who served as consultants in each of the medical specialties. These men had been taken directly from civilian practice where all had been outstanding in their field of

endeavor. The consultant in anesthesiology was Colonel Ralph Tovell. The consultants visited each one of the army hospitals in order to criticize and suggest regarding anesthesia organization and practice. Through the influence of the consultant procurement of equipment and supplies became easier and more items were available. Each one of the anesthetists of the auxiliary surgical group was sent on recommendation of the consultant to a British civilian or army hospital for several months in order to gain experience of British wartime anesthesia methods. The writer was first sent for several weeks for training under Dr. Michael Nosworthy and then later for five months to the Nuffield Department of Anesthetics at Oxford University, experiences which were invaluable for future work in the army. In the early part of 1944 an extensive training program was instituted under the direction of the theater consultant in which a series of lectures was delivered by himself and those anesthetists in the theater whom he designated for the work. The author had the good fortune to be chosen to aid in this program. The course lasted for one week during which forty lectures were given to a class of fifty medical officers. After each course of lectures each one of these officers was sent to an army hospital for a period of one or two months for further training. In this way a large reserve of officers was built who could serve as anesthetists. As a further training source all anesthetists in the theater were encouraged to attend the monthly meeting of the section on anesthesia of the Royal Society of Medicine. After these meetings American anesthetists used to gather and it was then possible to exchange ideas on anesthesia practice in the various army hospitals. The presence of a consultant in anesthesiology with the necessary rank proved invaluable in advancing the service to the soldier patients, in obtaining equipment and in arranging for such needed training programs.

II. EXPERIENCES IN FORWARD HOSPITALS DURING THE EUROPEAN CAMPAIGNS

During and following the Normandy invasion this Auxiliary Surgical Group was used to augment the medical services of the field and evacuation hospitals of the First United States Army.[3] The Chief Consultant in Surgery for the Medical Corps, First United States Army, was at the same time Commanding Officer of the Auxiliary Surgical Group and as such he sent teams of medical officers to field and evacuation hospitals which needed additional personnel during periods of battle. This was an efficient method of assuring that additional surgeons and anesthetists were available during peak loads. Transportation for members of the surgical team and their equipment was provided by the headquarters of the Auxiliary Surgical Group. The anesthetists in the Surgical Group were physicians who in civilian life had devoted themselves to that specialty. Each team consisted of a chief surgeon, an anesthetist, an assistant surgeon and a fourth physician who was designated as the shock man. The duty of the shock man was to assist in furnishing the preoperative transfusion therapy for the patient, to assist at operations occasionally, to write the necessary operative notes for the field medical chart and to assist at transfusion therapy in the operative tent during circulatory emergencies.

There were four enlisted men on each team. Their functions were (1) scrub nurse, (2) circulating nurse, (3) assistant either to the shock man or at operations as the occasion demanded and (4) assistant to the anesthetist. The enlisted man who assisted the anesthetist prepared anesthetic equipment and supplies, assisted in and set up the apparatus for transfusion therapy and assisted the anesthetist during tracheobronchial catheter aspirations, bronchoscopies, endotracheal intubations and other anesthetic procedures. Such assistance was invaluable, especially when the anesthetist was anesthetizing for two operations at the same time.

The team ordinarily used the equipment of the hospital to which it was attached, but each team had a certain amount of equipment of its own which as time went on gradually increased. Thus each anesthetist was allotted a portable anesthesia outfit containing airways, ether mask, needles, syringes, blood pressure apparatus and complete endotracheal equipment. Some anesthetists were fortunate enough to have been assigned a portable gas machine. This enabled these anesthetists to offer more service as there was nearly always a need for anesthetic equipment. Early in the campaign each field hospital had only one gas machine but after the first six weeks this was increased to two. Each field hospital had one or two sets of the portable anesthetic outfits just men-

tioned and several portable suction apparatus which were for use in the preoperative shock tent, in the postoperative recovery ward and in the operating tent. Apparatus for oxygen therapy consisted of the BLB mask. Oxygen for oxygen therapy and for anesthesia was supplied in the large size G or H American cylinders containing 244 cubic feet of oxygen under 2,200 pounds per square inch. The pressure was reduced by an automatic pressure regulator and delivery of the gas for oxygen therapy was controlled by a dry flowmeter. Nitrous oxide was also supplied in large size G cylinders. Each field hospital carried from 75 to 90 of these large cylinders containing oxygen or nitrous oxide on the initial landings. The drugs available for anesthesia were ethyl chloride, chloroform, ether, procaine for local anesthesia and pentothal® in 1 gm. ampuls to be mixed with 50 cc. of sterile distilled water in ampuls. Soda lime, both of British and American manufacture, was available but this was not always of the correct size for anesthesia purposes. Sometimes the smaller size used for metabolism apparatus was provided. This offers too high a resistance to breathing when used in anesthetic apparatus and could not be used. Endotracheal equipment consisted of the well known Magill tube of American manufacture. Two sizes only were available, the No. 8 and the No. 10. This seemed to be satisfactory for the type of patients who were treated. The large size folding Guedel laryngoscope was the standard instrument although many anesthetists had their own Macintosh laryngoscopes which had been developed in 1943.

Transfusion therapy was provided by means of British-made apparatus and whole blood obtained from England. In August, 1944, blood and equipment began to arrive from the United States. This was blood diluted with Alsever's* solution. The preoperative administration of fluid replacement therapy was in the hands of medical officers especially detailed to this duty assisted by the shock man of the surgical team. During the operation this function was taken over by the anesthetist. However, if severe sudden hemorrhage occurred, one of the officers of the team, usually the shock officer, was called upon to assist further in transfusion therapy. Frequently it became necessary to begin transfusions rapidly in one or two veins in addition to the one already in use. Many examples arose in which a life was saved because a medical officer was readily available for initiating further transfusion therapy following sudden severe hemorrhage. Enlisted personnel can be taught to set up transfusion therapy apparatus and to assist but they cannot always be relied upon to perform actual venipuncture when the veins are collapsed. Replacement therapy can usually be performed during an operation by the anesthetist, but when sudden severe hemorrhage occurs, additional assistance in the form of an officer especially skilled in shock therapy must be readily available. One such officer could conveniently supervise transfusion therapy at several operating tables.

As anesthetist on the surgical team the primary duty was in the operating tent. However, the anesthetist served more effectively by frequent visits to the preoperative shock tent in company with the rest of the team so that he could evaluate the condition of the patients who were to come under his care in the course of the next few hours. At these visits each patient was seen in company of the surgeon and the preoperative shock ward officer. Supportive treatment was suggested. Preoperative medication consisting of atropine and morphine was ordered if none had been given previously, and if necessary, tracheobronchial catheter aspiration was performed. Postoperatively patients were seen in order to determine their progress and to carry out treatment such as tracheobronchial catheter aspiration or intercostal nerve blocking for painful ribs when necessary. Postoperatively all patients were instructed by the anesthetist and by nurses and corpsmen in the routine of cleaning the air passages by coughing. Postoperative surgical treatment was in the care of special officers for this purpose but each operating surgeon was responsible for the direction of the care of his patients. Postoperative fluid replacement therapy, including blood transfusions, was likewise in the hands of the ward medical officer.

The great majority of patients coming to a field hospital were the non-transportable severely wounded soldiers suffering from penetrating injuries to the chest or abdomen or compound fractures of the extremities. Some had combinations of these such as penetration of both chest and the abdomen or penetration of the abdomen and compound fracture of an extremity. Many had additional multiple

*Alsever's solution: glucose–sodium citrate–saline preservative.

wounds. Many were in shock. Evacuation hospitals also received some of the aforementioned severely wounded individuals and in addition those with maxillofacial and craniocerebral injuries.

The information in the following tables was abstracted from records which were kept on each patient during anesthesia. These anesthesia records were written into 5 by 8 inch notebooks which fit conveniently into the pocket of a field jacket. Type and extent of wound, times and dosages of morphine, times and amounts of transfusion therapy, anesthetic agents and methods, anesthetic complications, blood pressures, pulse rates, respiratory rates, times of induction of anesthesia and operation, and operative and postoperative complications including death and autopsy findings were kept on each patient.

Table III shows the anesthetic agents used by the author for each type of operation. There was a total of 245 operations during a five-month period. Many patients had more than one wound requiring multiple operations, but for purposes of classification the major operation only is listed with the exception that combination of a thoracic or abdominal wound with a major wound of the extremity are classified as thoracic-extremity and abdominal-extremity operations. Severe extremity wounds include compound fractures of the extremity, traumatic amputations, severed arteries, and massive lacerations and avulsions. The table shows that the greatest use of pentothal® was for superficial and extremity wounds. However, not all extremity and superficial wounds were operated upon under pentothal® anesthesia. More than half of the extremity wounds were operated upon with ether anesthesia. One thoracic operation, a closure of a sucking chest wound, was performed under pentothal® anesthesia. All other abdominal and thoracic operations were performed under ether anesthesia preceded by N_2O, ethyl chloride or pentothal® for induction. Ethyl chloride was used most commonly for induction into ether anesthesia. It was quite satisfactory for this purpose.

TABLE III

ANESTHETIC AGENTS USED IN 245 OPERATIONS

Type of Operation	Pentothal	Pentothal N_2O	Ether	Others	Total
Thoracic	1		24		25
Abdominal			37*		37
Thoracicoabdominal			9		9
Thoracic-extremity			3		3
Abdominal-extremity			6		6
Extremity	24	5	34	One case had ethyl chloride-N_2O	64
Superficial	45	2	15	One case under procaine	63
Maxillofacial (including neck wounds)	4†		25	One case under procaine-local nerve block	30
Miscellaneous	1	3	4		8
Total	75	10	157	3	245

*Two cases preceded by abdominal wall blocks of procaine.

†One case also had procaine.

Note: Case 99 had no operation; Case 156 had no anesthetic.

Of these 245 anesthetics 140 or about 57 per cent were administered with the carbon dioxide absorption technic. Of these 140 cases eighty-five also required endotracheal intubation. All but two of the thoracic, abdominal, thoracico-abdominal, thoracic extremity and abdominal extremity cases were performed with the carbon dioxide absorption technic. Eight of the maxillofacial cases were performed with Flagg can endotrachial technic when no gas machine was available which was entirely satisfactory for this type of case.

There was an almost complete absence of regional and local anesthesia methods. Regional anesthesia methods are not the choice for operations within the body cavities for they tend to limit the surgeon. They may thus result in inadequate exploration. Local anesthesia is not the choice for débridement of large wounds for it, too, restricts the surgeon and may result in inadequate débridement. General anesthesia with complete insensitivity allows for complete exploration during operation or complete débridement of the wound. War wounds are usually multiple and wounded men are seldom in a suitable mental state for regional anesthesia during an operation of any magnitude. It is nearly always more kind to render them unconscious. The foregoing statements apply only to the seriously wounded individuals treated in most forward hospitals. Local anesthesia has a wider application in the removal of superficial shrapnel and in débridement of minor gunshot wounds. The auxiliary team to which the author was attached had little experience with such wounds.

TABLE IV

DURATION OF ANESTHESIA FOR EACH TYPE OF OPERATION*

	Less than 30 min.	1 hr. or Less	1 hr., 30 min. or Less	2 hr. or Less	3 hr. or Less	4 hr. or Less	Over 4 hr.	Total	Average Duration of Anesthesia
Thoracic	1	6	6	3	4	1	0	21	1 hr., 39 min.
Abdominal	0	4	4	9	7	5	1	30	2 hr., 11 min.
Thoracicoabdominal	0	0	1	4	3	1	0	9	2 hr., 14 min.
Thoracic-extremity	0	0	1	1	1	0	0	3	1 hr., 36 min.
Abdominal-extremity	0	0	0	1	4	0	1	6	2 hr., 42 min.
Extremity	9	23	13	10	4	2	0	61	1 hr., 10 min.
Superficial	50	8	3	2	0	0	0	63	27 min.
Maxillofacial (including neck wounds)	5	3	5	5	8	2	2	30	1 hr., 53 min.
Miscellaneous	2	2	2	2	0	0	0	8	1 hr., 5 min.
Total	67	46	35	37	31	11	4	231	

*The record of time in 14 cases was incomplete and could not be included in the table. The horizontal totals are not cumulative. For example, the number of cases listed under 1 hr. or less includes those of 1 hr. duration or less but not those of 30 min. or less which had been previously tabulated.

Table IV shows the duration and average duration of anesthesia for each type of operation. Induction times are not shown but they varied from three to twenty minutes depending on the amount of preparation needed for the operation. There are only 221 cases listed here as the record of time in fourteen cases was incomplete and could not be included in this table.

It has been reported when the peripheral vessels are constricted as from cold or shock the subcutaneous absorption of morphine is poor.[4] Following resuscitation, warmth or anesthesia the peripheral vessels dilate, the circulation in the skin increases and morphine previously injected is rapidly absorbed, leading to morphine poisoning characterized by respiratory depression, pinpoint pupils and delayed induction of anesthesia.

In ninety-six cases in which complete information was available on the amount of morphine administered from the time of wounding to operation only four cases showed respiratory rates at any time during anesthesia slower than 16 per minute. In these four cases the lowest respiratory rate ranged from 8 to 12 per minute without other signs of possible morphinism as prolonged induction and pinpoint pupils. In most of the ninety-six cases the last dose of morphine was given more than five hours before operation. This usually consisted of morphine, ½ gr., which was the routine administration at the time of wounding. In this series of cases the postwounding administration of morphine did not appear to make the conduct of anesthesia more difficult.

There were seventeen major respiratory complications following 247 operations and anesthetics. It was not possible under the existing military circumstances to determine the preoperative respiratory condition of these patients. Some patients were seen only a few minutes before anesthetization allowing insufficient time to examine the respiratory tract. In the future the incidence of preoperative respiratory complications in battle casualty should be determined.

Atelectasis. There were three cases of atelectasis. All three patients had gunshot wounds of the abdomen and received ether anesthesia. Shock developed in all three during the operation despite the administration of what seemed to be adequate fluid replacement therapy. One patient completely recovered following tracheal catheter aspiration. The second died of heart failure to which the atelectasis probably contributed, and the third died of hemorrhage unrelated to atelectasis.

Massive Collapse. Two cases of massive pulmonary collapse occurred. One occurred just as the patient was turned to the supine position following a two and a half hour thoracotomy for gunshot wound of the chest under ether anesthesia. Improvement followed bronchoscopy. The other occurred the day after the opening of a colostomy under pentothal® anesthesia. Just two days previous to the colostomy the patient had had an abdominal operation requiring two and a half hours for repair of perforation of the gut due to gunshot wounds. This patient responded to tracheal aspiration through a Magill endotracheal tube.

Acute Bronchitis. Six cases of acute bronchitis occurred. This manifested itself as accumulation of tracheal secretions and seemed to be due to an inability to cough or rid the trachea of secretions. The presence of large abdominal incisions or chest wounds with removed ribs gave rise to pain which inhibited cough. Although only six cases are recorded in the notes, there were probably more of these. All six of these patients received ether anesthesia. Three of these patients had thoracic operations. One of these died. Tracheal aspiration was used but was not used continuously and it is probable that death was at least in part due to anoxia as the result of excessive pulmonary secretions. One patient had an operation for removal of a bullet from the palate. Excessive pulmonary secretions developed in this patient. An endotracheal tube was left in place in order to perform suction through it and he recovered. An exacerbation of an existing bronchitis developed in one patient following the closure of an evisceration. He was treated with repeated tracheal aspirations and recovered. In the last patient acute bronchitis developed the day after an abdominal-thoracic operation. This was treated with tracheal aspiration and the patient recovered.

Aspiration Pneumonia. There were two cases of aspiration pneumonia. One patient with a severe liver laceration became drowsy and then semi-comatose three days after operation and had recurring vomiting with aspiration of stomach contents. For two days attendants aspirated regurgitated brown fluid from the hypopharynx, but the patient died. The other case is of interest and will be described in detail:

This twenty-eight year old soldier (Case 27) received a penetrating wound of the chest, abdomen, left shoulder, flank and buttocks. When he entered the operation tent he was vomiting. Anesthesia was started but after a few breaths of N_2O-ether he vomited again. He was allowed to vomit and anesthesia was then rapidly induced with ethyl chloride–ether sequence, and an endotracheal tube inserted. The patient was turned into the lateral position so that the left shoulder was uppermost in order that it could be débrided. During the débridement the patient vomited and suction was immediately used. During the course of the operation the endotracheal tube was changed and it was noted that the hypopharynx was full of fecal vomitus. At the end of the

operation the patient was bronchoscoped until the trachea and bronchi were clean. The operation required three hours and consisted of an exploratory laparotomy with closure of hole in the stomach and suture of the spleen, closure of hole in diaphragm and closure of sucking chest wound, and débridement of five wounds of the left shoulder, flank and buttocks. Immediately postoperatively his circulatory condition was satisfactory. Considerable mucus developed in the trachea which was aspirated with a catheter. On the first postoperative day the patient began to show circulatory depression and on the second postoperative day he died. Autopsy revealed the left lower lobe of the lung to contain mucopurulent material and plugs which occluded all the smaller bronchi. There was thick, tenacious, mucohemorrhagic membrane lining all bronchi and bronchioles.

This is a death due to aspiration of vomitus with resulting pneumonitis. There were several errors and omissions in the conduct of the case. First, although battle casualties did not routinely have the stomach contents washed out, in a case such as this with vomiting before induction of anesthesia the procedure might have been of benefit. Secondly, the patient should not have been allowed to vomit during anesthesia. Thirdly, for patients with food in the stomach and vomiting the ballooned or cuffed endotracheal tube should have been available to tamponade the space between the trachea and the endotracheal tube.

Bronchopneumonia. There were two cases of bronchopneumonia. One patient who died seventeen hours after a five-hour abdominal and maxillofacial operation under endotracheal ether anesthesia had shown roentgen ray evidence of bronchopneumonia before operation. Bronchopneumonia developed in the other patient following ether anesthesia for a thoracicoabdominal operation. This patient had paralytic ileus postoperatively and no doubt the distention of the gut contributed to the lung immobility by compression. Tracheal catheter aspirations aided in recovery.

Tension Pneumothorax. There were two cases of tension pneumothorax, neither of which was connected with the management of the anesthesia period. One patient with tension pneumothorax died an hour after operation. The other patient recovered following diagnosis and treatment.

An important contribution to the therapy of postoperative and postanesthetic pulmonary complications was the almost routine use of tracheobronchial catheter aspiration through the Magill endotracheal tube. This was carried on throughout operation, particularly where there was evidence of secretions in the trachea and bronchi. At the end of the operation the tracheobronchial tree was thoroughly cleansed by aspiration through the endotracheal tube or bronchoscope. Postoperatively in the ward each patient received a can into which he was encouraged to expectorate. Doctors and ward personnel constantly urged the soldiers to cough up mucous secretions and to take deep breaths. Tracheobronchial catheter aspiration was used when these measures failed.

Vomiting. Postoperative vomiting was not recorded in every case. However, vomiting before or during anesthesia was recorded in six cases of 247. Of these six cases three were during pentothal® anesthesia. No complications were attributable to the vomiting except in the case of the soldier previously described who died of aspiration pneumonia. All six cases were quickly treated with suction. Vomiting in the anesthetized patient is a catastrophe which may cost his life. It can be assumed that every battle casualty has some food in his stomach. Gastric lavage was not performed in any of the field hospitals in which the author served. The great number of casualties made such a procedure impractical. Safety in the anesthetization of these patients lies in a rapid smooth induction, adequate depth of anesthesia for maintenance and use of the endotracheal tube, preferably with a cuff, which limits the ingress of vomitus to the trachea should vomiting occur. The Trendelenburg position and suction apparatus must always be available. One particular danger in patients who vomit is reanesthetization without clearing the air passages, for the reflexes are then abolished allowing the vomitus to gravitate from the hypopharynx into the trachea, bronchi and lungs.

Spasm under Pentothal® Anesthesia. Four cases of severe laryngospasm occurred during pentothal® anesthesia. (1) The first was precipitated by the presence of thick mucus in the trachea. Deepening anesthesia with pentothal® was to no avail, but a change to ether by means of manual bag pressure to force past the spasm provided sufficient relaxation to insert an endotracheal tube. (2) Severe laryngospasm

with cyanosis following pentothal® induction developed in one soldier. Laryngoscopy was performed and a blood clot removed from between the vocal cords. The operation was completed uneventfully. (3) A soldier who was coughing before anesthesia received 800 mg. of pentothal® over a ten-minute period. At the end of this period he vomited and became deeply cyanotic. The vomitus was removed from the throat by suction and oxygen was given during the episode of laryngeal spasm. As anesthesia lightened, the cough reflex

TABLE V

DEATHS IN 274 SERIOUSLY WOUNDED SOLDIERS UNDERGOING ANESTHESIA AND OPERATION

Case	Survival Period	Clinical Diagnosis and Autopsy Findings
4	Died on table	Huge avulsion of perineum and buttocks, severe uncontrollable hemorrhage
10	Died on table	Penetrating wound of chest, extensive contusion of lung, shock
26	5 days	Penetrating wound of abdomen, laceration of liver, retroperitoneal hematoma
27	2 days	Penetrating wound of chest and abdomen, laceration of the spleen and stomach, laceration of diaphragm; died of aspiration pneumonia
30	9 hr.	Penetrating wound of abdomen, multiple perforations of the gut, edema congesting the lungs; died suddenly while in apparently satisfactory condition
34	1 day	Penetrating wound of abdomen, perforations of the large bowel, ileum and stomach, peritonitis
37	Died on table	Penetrating wound of the abdomen, multiple perforations of the gut, hemorrhage, inadequate fluid replacement therapy
52	4 days	Penetrating wound of the abdomen, large laceration of the liver
94	4 days	Penetrating wound of the abdomen, compound fracture both femurs, and forearm with arterial occlusion of one leg, anuria
97	2 days	Penetrating wound of the sacral region, meningitis
100	Died on table 1/2 hr. postoperatively	Penetrating wound of the chest, laceration of the diaphragm and the lung, shock, position change while in shock
104	17 hr.	Penetrating wound of the neck, abdomen, legs, thigh, bilateral hypostatic pneumonia, extensive hematoma of mesentery
106	15 1/2 hr. postoperatively	Penetrating wound of the chest and abdomen, laceration of the diaphragm, laceration of the liver, multiple leg wounds, occlusion of femoral artery, edema, congestion and petechial hemorrhages of the lungs, and petechial hemorrhages of the heart, probable blast injury
111	17 hr	Penetrating wound of the abdomen and perforation of the gut, compound fracture of the arm, shock
114	1 hr.	Penetrating wound of the back, destruction of the kidneys, huge laceration of the diaphragm, foreign body stomach, tension pneumothorax, shock
116	13 1/2 hr.	Penetroting wound of the abdomen, perforation of the gut, avulsion of hip, shock
119	13 hr	Penetrating wound of the back and abdomen, laceration of gallbladder and common bile ducts, perforation of the duodenum, perforations of the small and large gut, peritonitis, shock
159	13 hr.	Penetrating wound of the back and chest, laceration of the kidney and liver, shock

returned and the patient was able to clear the air passages. (4) A soldier received pentothal® for what was to have been superficial débridement but the exploration of the wound became deeper and deeper until the perirenal space was exposed. The surgical stimuli became more intense and the patient began to vomit and cough. Laryngospasm soon followed. The surgical stimuli were removed, the pharynx was cleared and anesthesia was deepened with N_2O and further pentothal.® The operation was then completed.

These four cases illustrate the tendency for laryngospasm with pentothal® but more emphatically do they show that there was definite mismanagement in the choice of the drug for patients who have foreign bodies in the pharynx or in the use of the drug where intense surgical stimuli are anticipated. Cases 3 and 4 emphasize the fact that vomiting can occur with pentothal® anesthesia. Quick action and cooperation on the part of the surgeon and the anesthetist were able to avoid further serious mishaps in each case noted.

Deaths. A brief summary of the deaths which occurred in this series of 245 anesthetic administrations is contained in Table v. Some of the cases are discussed in more detail in other parts of this paper. These cases represent the type which must be saved to reduce the overall death rate among the wounded.

III. CIRCULATION IN THE SEVERELY WOUNDED DURING ANESTHESIA

Many of the seriously wounded soldiers have recently been resuscitated from shock when they are brought to operation and the circulation is in a precarious state. The following studies have been made to show some of the circulatory changes which occur during anesthesia in the severely wounded soldier:

Changes in Systolic Blood Pressure Following Induction. A reliable indication of the circulation available under field conditions is the blood pressure. Blood pressure readings were made and recorded at five- or ten-minute intervals whenever possible. A comparison between the blood pressure before and after induction of anesthesia should give some indication of the effect of anesthesia on the circulation. Such a comparison should differentiate between the blood pressure changes due to anesthesia alone and those due to traction reflexes, surgical shock and hemorrhage occurring later in the operation. A series of ninety-one cases were analyzed which were in general the most seriously wounded.

Table VI shows the blood pressure changes following the induction of anesthesia and before the onset of operation in eighty-nine cases in

TABLE VI

BLOOD PRESSURE CHANGES UNDER ANESTHESIA

		Blood Pressure Change Following Induction of Anesthesia	Blood Pressure Change Following Anesthesia and Operation
Fall	−31 or more	9	17
	−21 to −30	4	11
	−11 to −20	9	5
	−10 or less	20	22
Rise	+10 or less	11	11
	+11 to +20	6	5
	+21 to +30	5	3
	+31 or more	2	1
No change		23	15
No record		2	1
Total		91	91

which data were complete. In most cases induction periods in these major operations were between twelve and thirty minutes, ample time for changes to occur due to anesthesia. It will be seen that twenty cases exhibited a fall of blood pressure of 10 mm. Hg or less. Two of these twenty patients had preoperative blood pressures of 90 mm. Hg or less, that is, they were in shock or recently resuscitated from shock. Table VI further shows that twenty-two patients had a fall in blood pressure of more than 10 mm. Hg. Of these fifteen did not have blood pressure readings below 90 mm. Hg systolic during this period. Seven cases however, showed blood pressure readings below 90 mm. Hg. Three of these patients had peripheral circulatory failure before the induction of anesthesia as evidenced by systolic blood pressure readings of 85 mm. Hg or below. From this it can be concluded that nearly one-fourth of the eighty-nine seriously wounded patients receiving anesthesia exhibited fall of blood pressure of more than 10 mm. Hg, but of these only seven cases or 8 per cent of the total ninety-one cases fell to below 90 mm. Hg.

Of a total of ninety cases in which data were available thirty-three showed a fall of more than 10 mm. Hg between the reading before induction and the blood pressure reading at the end of the operation. (Table VI.) Twenty-two cases showed a fall of 10 mm. or less in these

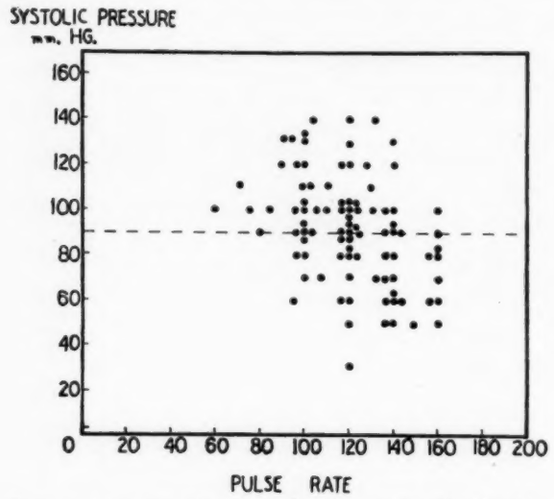

FIG. 1. Scatter diagram showing the relationship between the pulse rate and the systolic blood pressure in ninety-one seriously wounded battle casualties during anesthesia.

readings. The increased number of cases exhibiting a fall of blood pressure over this longer period of time is attributable to the cumulative effects of the operation as well as to the anesthesia.

Anesthesia in Patients with Systolic Blood Pressure of 85 mm. Hg or Below. Nine patients were anesthetized and operated upon who had preanesthetic systolic blood pressures of 85 mm. Hg or below. Each one of these patients received replacement fluid therapy during operation as treatment for the depressed peripheral circulation. Three of these were resuscitated so that the blood pressure at some time during operation was elevated above the preanesthetic level. All three survived. The other six patients exhibited circulatory depression throughout the operation and four of these subsequently died.

Hypertension in the Recently Resuscitated Patient. Nineteen wounded soldiers from the series of ninety-one patients exhibited hypertension or blood pressure over 140 mm. Hg systolic prior to anesthesia. Following induction of anesthesia there was a decrease in the blood pressure in fourteen cases, an increase in three and no change in two. At the same time the pulse rate decreased in seven cases, increased in eight and showed no change in four.

From Table VI it should be noted that forty-seven cases showed no change or a rise in blood pressure following induction of anesthesia.

Changes in the Pulse Rate. Following induction of anesthesia in eighty-nine cases in which data were complete there was an increase in the pulse rate in thirty-three, a decrease in thirty-six and no change in twenty cases. Nine patients had preanesthetic pulse rates below 100. Of these only one patient had concomitant blood pressure below 100 mm. Hg systolic. In this instance the blood pressure was 90/60 and the pulse rate was 84 before anesthesia. After induction the pulse rate was 160, with no change in the blood pressure. Bradycardia evidenced by a pulse rate of 60 or below was not observed in any of these wounded patients.

Relation between Blood Pressure and Pulse Rate during Anesthesia. Figure 1 is a scatter diagram of the lowest blood pressure readings exhibited during the operation plotted against the corresponding pulse rate readings. When the pulse was imperceptible, the next recorded pulse rate was used. It shows no correlation between blood pressure and pulse rate under anesthesia. It is interesting that most of the pulse rates are 100 or over for all blood pressures. From this it may easily be seen that the pulse rate gives no indication of what the blood pressure might be.

Criteria of Circulatory Status. The severity of the wound, the systolic blood pressure, the response to fluid replacement therapy and the volume of the pulse were the principle criteria in judging the degree of circulatory depression during anesthesia. A systolic blood pressure below 90 mm. Hg was considered to be warning of peripheral circulatory failure. Some patients with impending circulatory failure might have blood pressure above this level because of the vasopressor effect of the closed absorption technic. The pulse volume in circulatory depression was weak and sometimes the pulse was imperceptible at the wrist. The color was pale in serious circulatory depression under anesthesia. A slow response and the necessity for large volumes of replacement fluid in order to elevate the systolic blood pressure were an indication that the circulation was severely depressed from other causes in addition to blood loss. Any change of position in the recently resuscitated patient either anesthe-

tized or unanesthetized would frequently precipitate circulatory collapse. It was fortunate that the litter containing the patient was placed directly upon two saw horses.

Transfusion Therapy. The specific treatment for the reduced blood volume of the severely wounded was fluid replacement therapy with blood or plasma. On entrance to the operating tent a vein in the ankle or anticubital fossa was exposed and a No. 15 cannula was tied in place. A blood transfusion was then started. During the operation if the rate of replacement was inadequate to compensate for the loss of blood occurring from the operative site, additional venipunctures were performed and transfusions started in one or two additional veins. Eighteen gage needles or larger were used. The blood flow rate through a needle with smaller bore than No. 18 was inadequate. Even with the No. 18 gage needle, when the blood was viscid or when the veins were collapsed in severe shock it became necessary to use pressure to facilitate transfusion. Pressure was applied by pumping the bulb from a blood pressure apparatus attached to the air vent of the blood transfusion bottle.

The following report will illustrate how mismanagement of the anesthetic period resulted in death from circulatory failure.

CASE 37. The anesthetist had been traveling all day in order to reach a new assignment with a surgical team. He entered the operating tent and was asked to anesthetize a patient already on the operating litter. The patient suffered from a penetrating wound of the abdomen. A hurried search was made to locate and assemble the necessary equipment and the patient was anesthetized with the ethyl chloride–ether sequence. Anesthesia was maintained with ether using the absorption technic. When the abdomen was opened, it was found to contain about 1,000 cc. of free blood. There were three tears in the small bowel and three in the large bowel near the splenic flexure. There was also a bleeding tear in the mesentery. These were all closed and a splenic flexure colostomy was performed. Throughout the operation there was some respiratory obstruction. Anesthesia was deep in order to overcome vocal cord adduction and also in order to slow the respirations. There was a progressive fall in blood pressure and progressive deterioration in the volume of the pulse. After an hour one of the corpsmen started to set up the apparatus to give a transfusion. There was delay in assembling the equipment and difficulty in getting the blood to flow through the apparatus. The corpsman attempted venipuncture for twenty minutes after which the needle was inserted by the anesthetist with difficulty as the arm had by then begun to swell from peripheral edema resulting from circulatory deterioration. The patient received one-half bottle of whole blood before he died. The whole incident took an hour and forty-five minutes.

Intravenous transfusion therapy should have been started before the operation on this patient. Good team organization would have resulted in a few moments' delay and the patient's condition could have been more adequately evaluated. The necessary equipment could have been assembled including apparatus for endotracheal intubation. The use of a depth of anesthesia deeper than that necessary to overcome vocal cord adduction was inexcusable. There are other means of relieving this form of obstruction. Endotracheal intubation would have allowed the operation to be performed in a lighter plane of anesthesia, would have insured an unobstructed airway and would have freed the two hands of the anesthetist for the necessary task of administering transfusion therapy. In summary, this preventable death was due to inadequate fluid replacement therapy, obstruction to respiration and overdose of anesthetic agent.

The following case was observed by the author:

G. H., a German prisoner of war, aged twenty-three, suffered a gunshot wound of the calves of both legs thirty hours before operation. He received 1,000 cc. of plasma in the field hospital but despite that he was in shock with cold, pulseless feet. He received morphine, ⅛ gr., and atropine, 1/100 gr., one hour before operation. Anesthesia was induced and maintained with sodium pentothal,® 1¼ gm. The patient was prone upon the litter during the operation which consisted of a removal of the soleus and gastrocnemius muscles of the left leg and débridement of the right leg. It was noted that gas gangrene was present and 300,000 units of antitoxin were given. During the operation there were several periods of respiratory obstruction as evidenced by snoring. Toward the end of the operation, which required forty-five minutes, plasma was started intravenously. No blood was available. The pulse was weak

and fast. Two and a half hours after the operation the patient was still unconscious with a fast pulse rate. The skin was warm and dry. He was receiving oxygen and had received by this time 1,000 cc. of plasma. Three hours after the operation he responded by talking. The pulse was of better volume but was still fast in rate. He had a pallid and toxic appearance. Six hours after operation he again became unconscious and had a weak, fast pulse. The skin at that time had a cool, pallid appearance. He expired eleven hours after operation.

Death was from gas bacillus infection but it was probable that the management of the anesthesia period and the lack of blood were contributory factors.

Case 53. W. B., a twenty-one year old soldier, suffered a penetrating wound of the chest from a shell fragment. Exploratory thoracotomy, débridement and closure of the chest were performed under ether anesthesia with endotracheal absorption technic. The operation required two hours and thirty-eight minutes during which time the patient received 500 cc. of plasma and 500 cc. of whole blood. The circulation was well maintained with a blood pressure of 110/60 mm. Hg and a pulse rate of 104 a minute. At the end of the operation the patient was turned from the lateral to the supine position. There were no respiratory movements on the right and severe cyanosis developed. The blood pressure fell 70/40 and the pulse rate rose to 120 a minute. A bronchoscope was immediately inserted and blood clots were aspirated from the right main bronchus. The right side of the chest was seen to expand and the patient's color improved. The blood pressure was again taken and found to be 120/80, with a pulse rate of 120 per minute.

This case shows the severe circulatory depression which can develop following occlusion of a bronchus by blood and secretions. The treatment for this type of anoxia caused by obstruction to respiration is immediate tracheobronchial aspiration either through a bronchoscope or through an endotracheal tube. Whenever blood or mucous secretions accumulate in the trachea and bronchi following injuries to the thorax or its contents, they should be removed. This reduces obstruction in the airway, decreases the work done in breathing, allows for better oxygenation and therefore helps to maintain the efficiency of the circulation.

Case 34. Lieut. C. H., aged thirty-three, suffered a penetrating gunshot wound of the abdomen eight and a half hours before operation. He received 3,500 cc. of plasma and 500 cc. of blood intravenously during the preoperative period. On entrance to the operating tent the blood pressure was 80/60 and the pulse 160. Following induction with ethyl chloride–ether sequence the blood pressure was 50/30, with a pulse rate of 140 a minute. Anesthesia was maintained with ether using the endotracheal absorption technic over a period of two hours and forty minutes during which colectomy, closure of a 5 inch hole in the stomach and a 3 inch hole in the duodenum, and iliocolostomy were performed. The peritoneal cavity contained a large amount of foul-smelling blood mixed with feces. The patient received 2,000 cc. of whole blood and 500 cc. of plasma intravenously during the operation, despite which the blood pressure remained at 70/40 mm. Hg. At the end of the operation the blood pressure was 80/50. Twenty minutes after the operation the blood pressure was 100/60 and the pulse rate 120. Postoperatively the patient received 1,500 cc. of plasma. He died of peritonitis one day after the operation.

In this case shock was due to peritoneal contamination with colon contents and did not respond to adequate fluid replacement therapy. The circulation in this patient was in addition depressed by anesthesia as evidenced by the drop in blood pressure following induction.

This type of case was not infrequently seen. Following penetrating gunshot or shell fragment wound of the abdomen it was noted that the peritoneal cavity contained blood mixed with feces. During operation the shock seen in these individuals was out of proportion to the blood loss and the response to transfusion therapy was poor. It was necessary to maintain the lightest plane of anesthesia consistent with the surgical needs in order to prevent further blood pressure fall. Moreover, in this type of patient, suffering from shock due to peritoneal contamination and hemmorrhage, once the oligemia had been corrected by transfusion of blood very little improvement in the circulation could be expected by further fluid replacement therapy.

Case 32. Sgt. H. W., aged twenty-eight, was struck by a shell fragment and received a penetrating wound of the abdomen with perforation of the gut and penetrating wound of

the arm. He received 500 cc. of plasma in the clearing station. In the field hospital he received 1,000 cc. of plasma and 2,000 cc. of whole blood which raised the blood pressure from 0 to 92 mm. Hg systolic. Just before the operation the blood pressure was 80/50 and the pulse rate 160 per minute. Abdominal wall block was performed with 70 cc. of 1 per cent procaine and anesthesia was induced with ethyl chloride–ether sequence and maintained with ether using the absorption technic. The patient received 1,000 cc. of blood and 500 cc. of plasma during the operation which consisted of an end-to-end anastomosis of the ilium, colostomy and ligation of the brachial artery. The blood pressure steadily rose until at the end of the three-hour operation it was 130/80, with a pulse of 120. Recovery was uneventful.

This case shows that it is possible to begin operation with a low blood pressure and fast pulse rate and to carry out the resuscitation during operation so that at the end of the operation the peripheral circulation has been restored.

Case 94. Capt. J. L., aged twenty-seven, was wounded in a tank. He suffered a compound fracture of both legs, with arterial occlusion of the right leg, a compound fracture of the right forearm and a penetrating wound of the abdomen. He received ½ gr. of morphine shortly after wounding. In the ten and a half hours which elapsed between wounding and operation he received 2,500 cc. of plasma and 1,000 cc. of whole blood. He received ⅙ gr. of morphine and $\frac{1}{100}$ gr. of atropine preoperatively. Preoperatively the blood pressure was 90/50 mm. Hg and the pulse rate was 160 countable at the temporal region but not at the wrist. Blood transfusion was started. Anesthesia was induced with ethyl chloride and maintained with ether using the endotracheal absorption technic. Twenty minutes after induction and before the start of the operation the blood pressure was 80/50 mm. Hg and the pulse rate 120 per minute. The volume of the pulse had improved. Throughout operation the blood pressure remained at 60/40 mm. Hg and the pulse rate 120 per minute. The patient received 1,000 cc. of whole blood during the operation which required two hours and twenty minutes. At operation the abdomen was explored and 3 feet of bowel were resected, both legs and the right arm were débrided and casts applied. At the end of the operation the blood pressure was 80/50 mm. Hg and the pulse rate 120 per minute; the respiratory rate was 24 per minute. The patient was awake when brought back to his cot. During the night he received 1,000 cc. of plasma and 1,000 cc. of intravenous fluid. He received 1,000 cc. of intravenous fluid the next morning, making a total of 7,500 cc. of intravenous fluid in twenty-four hours. His pulse postoperatively was between 80 and 94, respirations 20 to 24. Anuria developed and he died on the fourth postoperative day.

What small amounts of urine were voided or obtained by catheterization contained red blood cells. There was at no time a chill or fever following transfusion. Since the patient was in shock for hours, the anuria can be considered to be due to kidney damage resulting from prolonged low blood pressure. Although anesthesia contributed to this low pressure, other factors would seem to be insufficient replacement of blood and possibly the absorption of toxic products from the large amount of damaged tissue.

Case 35. Cpl. W. W., aged twenty-one, was struck by a shell fragment and received a wound of the left buttocks which penetrated into the abdomen. At the clearing station shortly thereafter he received ½ gr. of morphine and 500 cc. of plasma. At the field hospital two and a half hours later he received 1,000 cc. of plasma and 500 cc. of blood. He received ⅙ gr. of morphine as premedication. He entered the operating tent at 3:40 A.M. with blood pressure of 150/95 mm. Hg and pulse rate of 120; he was pale, apprehensive and in pain. Anesthesia was induced with ethyl chloride–ether sequence and maintained with ether using the absorption technic. Five minutes after induction the blood pressure was 180/100 mm. Hg and the pulse rate 130, with improved volume. His color was pink. When the peritoneum was opened, there was severe hemorrhage which came from the bullet exit hole in the sacrum. A few minutes later the blood pressure and pulse were unobtainable. The patient was pale and the respirations slow and shallow. The flow of blood was increased by using pressure obtained by attaching the bulb from a blood pressure apparatus to the air vent of the blood transfusion bottle. From 4:20 A.M. until 7:30 A.M. no pulse or blood pressure was obtainable. Shortly thereafter the systolic pressure was recorded at 80 mm. Hg, and at 8:00 A.M.

the blood pressure was 120/80 mm. Hg, the pulse rate 120 and respiratory rate 32. During this time, from 4:20 A.M. until 8:00 A.M., he received 5,500 cc. of whole blood and 1,000 cc. of plasma. The hemorrhage was finally controlled by packing the bullet exit hole in the sacrum with eight gauze sponges and peritonealizing the hollow of the sacrum. In addition, a resection and anastomosis of the ilium was performed. The patient received 1,000 cc. of blood postoperatively. He did well and one week later the packs were removed through the hole in the buttocks.

This case illustrates several important points. The 6,500 cc. of fluid replacement therapy during this time required the full attention of the shock man of the team assisted by one of the enlisted men. When the sudden hemorrhage occurred, it was necessary for him to perform two further venipunctures immediately. Throughout the period of hemorrhage he maintained adequate flow rates through all three needles. Maintenance of proper operating conditions required the full attention of the anesthetist. If straining or poor muscular relaxation had occurred, it would have restricted the exposure and made the bleeding area inaccessible, resulting in death from hemorrhage. If anesthesia had become light resulting in vomiting or vocal cord adduction, death from anoxia might have occurred. Only through liberal supplies of whole blood and good teamwork on the part of the surgeon, anesthetist and shock man was this patient's life saved.

SUMMARY AND CONCLUSIONS

The foregoing studies of wartime anesthesia have presented the work of an anesthetist attached to a surgical team of an Auxiliary Surgical Group in Europe during World War II. The equipment and supplies available for anesthesia purposes have been described.

An analysis of the types of anesthesia is included. Relatively few anesthetic agents were available, yet the seriously wounded soldier was operated upon with comfort and safety. The complications which were seen appeared to be related to the patient's serious condition and to the management during anesthesia and operation rather than to the use of any particular anesthetic agent. Good anesthesia in these patients depends largely on the application of fundamental principles learned in more ordinary conditions. The work demands special care because many of the patients are, or have recently been, in a state of shock and cannot be thoroughly prepared for operation. It has been shown that in the exercise of the skill necessary to care for these patients adequate auxiliary personnel are necessary for the surgeon and anesthetist.

This paper has been written not to present any new and startling findings but simply to record the experiences of one anesthetist in the field during World War II. The data are documentary and are similar to experiences of other medical officers associated with the writer during that time. It is hoped that presentation of these facts will be of value to those who must care for similar casualties.

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ENLARGEMENT OF THE MALE BREAST IN NAVAL PERSONNEL

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ENLARGEMENT of the male breast is somewhat of an enigma. The literature prior to 1930 was exceedingly scanty on the subject. Of recent years, however, our knowledge about this disease has increased, particularly in view of the contributions of Kriss, Menville and Karsner.

Clinically benign enlargement of the male breast is referred to as gynecomastia. This definition, however, should be reserved for those breasts showing microscopically benign proliferation of the stroma and ductal elements. This is in contradistinction to pseudogynecomastia (specific inflammatory, granulomatous and neoplastic disease).

The etiology of gynecomastia may be either known or unknown. A subdivision of the known category would include those cases of benign enlargement of the male breast which are in association with (1) known endocrine disturbances, (2) possibly known non-endocrine disturbances such as leprosy, pulmonary carcinoma and pulmonary tuberculosis and (3) questionably trauma. Gynecomastia has been reported in association with disease, more commonly neoplastic, of all the endocrine glands with the possible exception of the pancreas. Gynecomastia has also been reported following prostatectomy and following the administration of stilbestrol. The frequent occurrence of gynecomastia in hepatic insufficiency may be explained on the basis of an increased estrogen ratio. The element of trauma will be discussed elsewhere.

During the period from 1941 to 1944 in the U. S. Navy the total added male strength was 6,516,049. Of these the total incidence of specified diseases of the male breast was 1,891. A further breakdown reveals fifty-one cases of adenoma, three cases of carcinoma, forty-one cases of unclassified cysts, eleven cases of retention cysts, sixty-four cases of fibroma, twenty cases of lipoma, 856 cases of fibroadenoma (includes gynecomastia), sixty-three cases of mixed benign tumor, one case of mixed malignant tumor, 275 cases of acute mastitis and 506 cases of chronic mastitis.

This series comprises the admissions to two U. S. Naval Hospitals. Twenty-two of 15,904 patients were admitted over an eighteen-month period, an incidence of 0.139 per cent. Eighty-seven of 117,122 patients (including readmissions) admitted to a second institution over a period of five years showed an incidence of 0.076 per cent. In this series the age range was from seventeen to fifty-nine years.

Swelling was present in all cases. There were pain and tenderness in sixty-three cases, marked in two; thirty-five patients had no history of pain. One patient had a history of sanguineous discharge immediately after a bite on the breast. Eight patients gave a history of previous swelling and remission before onset of persistent enlargement. Five patients recorded weight loss. Four patients had psychosomatic complaints. A history of positive genitalia findings was recorded by ten patients; these ranged from right and left testicular disproportion to incomplete epispadias. These findings are of questionable reliability because they were not determined by a single recorder or a single group of recorders. The duration of symptoms ranged from one to ten years, with an average of 19.02 months.

There were thirty-two cases of nodular enlargement and thirty cases of diffuse enlargement. In thirty-four cases both nodular and diffuse enlargement were noted. McFarland believes from personal observations that gynecomastia develops irregularly with nodular enlargement preceding diffuse hypertrophy. McFarland's contention appears to be supported by the findings in this series of cases with a duration of symptoms of 12.13 months for nodular enlargement, 26.6 months for diffuse enlargement and 18.9 months when both nodular and diffuse enlargement are present. Regional axillary adenopathy was present in ten cases, two of which were bilateral; six cases of coexisting regional and general adenopathy

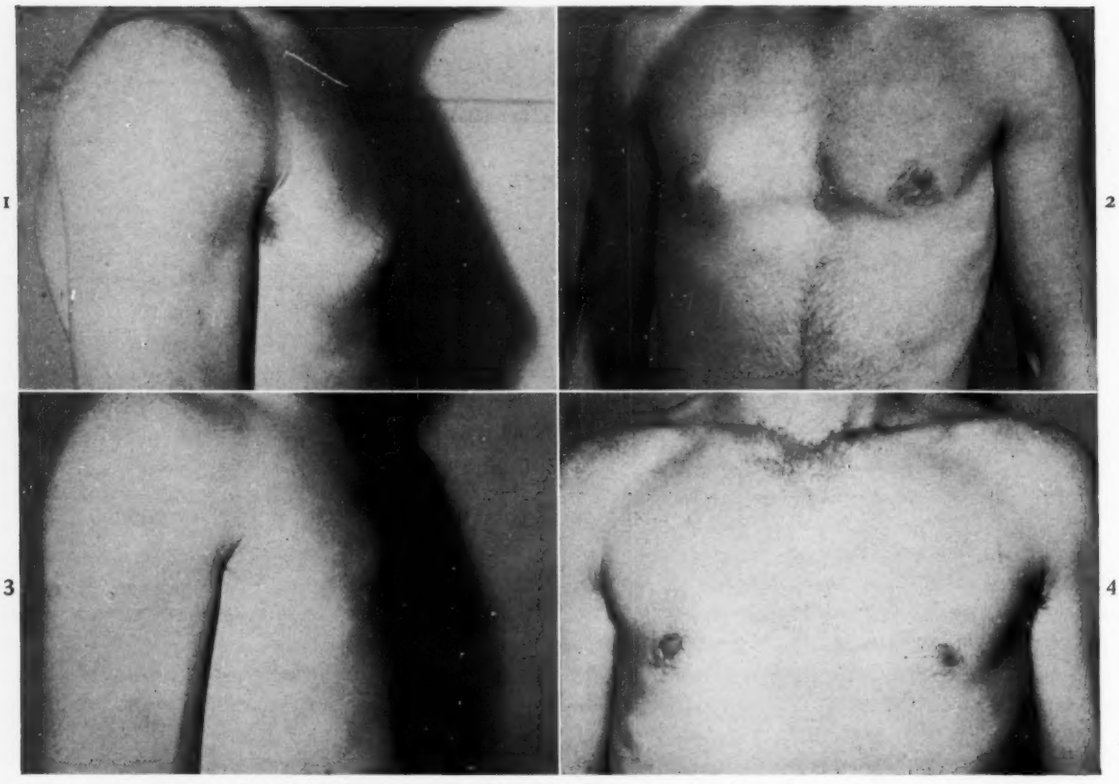

FIG. 1. Lateral view showing enlargement of right breast preoperatively.
FIG. 2. Anterior view of patient in Figure 1.
FIG. 3. Lateral view of patient in Figure 1 five days postoperatively; the nipple and areola are present without evidence of deformity.
FIG. 4. Anterior view of patient in Figure 3.

were found. Of this latter group one case showed persistent regional and general adenopathy two months following operation with no demonstrable cause. No adenopathy was found in thirty-seven cases and thirty-nine patients were not examined for adenopathy.

Twenty-one cases of the smaller series were unilateral and one was bilateral; of the larger series (ninety-three cases) thirty-one (33.3 per cent) were located on the right side, fifty-two (55.9 per cent) on the left and ten (10.8 per cent) were bilateral.

The effect of sudden or continuous friction does not appear to be very impressive. In twenty-two (22.58 per cent) of the cases studied there was a positive history of trauma with a time interval ranging from several hours to seven years after the injury to the onset of symptoms. A negative history was obtained thirty-one times and in forty cases there was no inquiry.

One patient gave a history of a brother with "swollen breasts." Thirteen gave a familial history of diabetes mellitus. Fifty gave no significant familial history and in thirty cases no inquiry was made.

The diagnosis of pathologic disorder of the male breast can best be accurately determined by microscopic examination. Clinically palpation, presence of adenopathy and in some cases weight loss do not serve to identify the type of lesion. Preoperatively thorough study to rule out infectious diseases, endocrine imbalance and hepatic function and psychiatric examination are advocated.

TREATMENT

Results with local and parenteral male hormone therapy have not been convincing. Operation is the treatment of choice and a semi-circular areolar incision is the incision recommended. This is just within the areolar border and involves the inferior half of the circumference. Incomplete simple mastectomy is not justified; six of our patients underwent subsequent complete simple mastectomy because of recurrence.

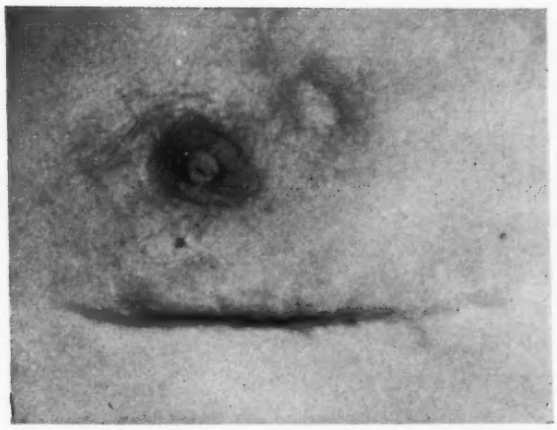

FIG. 5. This patient, a jockey, experienced difficulty in performing his duties because of scar resulting from operation done elsewhere. Compare this result with Figure 4.

Drainage can be avoided in an extremely high percentage of cases by use of careful hemostasis, obliteration of dead space and hot packs. The anesthesia of choice is local with preparation for intravenous or general anesthesia if radical dissection becomes necessary. (Figs. 1 to 6.)

PATHOLOGY

Prior to Karsner's communication 100 microscopic slides were reviewed in an effort to establish subdivisions of gynecomastia into a working classification. The result of the study is as follows:

1. The subdivision of gynecomastia into a working classification is not feasible.
2. Pathologically gynecomastia is a proliferative lesion of stromatous or ductal components of the breast in varying degrees of combination.
3. Any or all proliferative changes exist in the same breast; two or more changes may exist simultaneously.
4. In no instance were acini found.
5. In no case was intracanalicular fibroadenoma found.

FIG. 6. Patient referred for operation because of gynecomastia; operation was not performed because the patient was found to have Fröhlich's syndrome.

6. The degree of proliferation has no temporal significance. The response is probably due to the intensity of the stimulus and/or the receptivity of the tissue.

CONCLUSION

In 118 cases of gynecomastia studied no instance of cancer was found. Treatment consists of simple mastectomy to avoid the possibility of recurrence.

Acknowledgment: The kind and able assistance of Dr. Walter Scott Nettrour, formerly Chief of Surgery, U. S. Naval Hospital, Brooklyn, N. Y., has made this paper possible.

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CONSIDERATION OF ACUTE CHOLECYSTITIS*

AN ANALYSIS OF SEVENTY-SIX CASES

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ALTHOUGH the subject of acute cholecystitis already has been comprehensively reviewed at various times, there are certain aspects of the disease that will bear emphasis.

A study has been made of seventy-six cases of acute and subacute cholecystitis treated surgically at the Charleston General Hospital from January, 1937, through December, 1947. (Although twelve cases were pathologically classified as subacute, no case in which the microscopic examination failed to show infiltration of the gallbladder wall by polymorphonuclear leukocytes is included in this series.) The diagnosis as made by the operating surgeon has been used in those cases in which the gallbladder was not removed.

As will be noted in Table I the cases are divided into four groups according to the length of time that elapsed between the onset of symptoms of acute disease and the time of operation. Group I shows that there were sixteen patients operated upon within forty-eight hours of the time of onset of acute symptoms; in group II there are seventeen patients who were operated upon within forty-eight to ninety-six hours; group III shows that there were twenty-two patients operated upon within four to eight days of onset; in group IV there are twenty-one patients who were operated on within nine to twenty-nine days following onset of acute symptoms. It will be noted that of the twelve cases of subacute disease nine appear in group IV.

Palpable Mass. The presence or absence of a tender, palpable mass in the right upper quadrant of the abdomen should be noted. In our series such a mass was present in thirty-two cases or 42.1 per cent. McGuigan[15] reported a similar mass in 33 per cent of cases, Blumberg and Zisserman[3] reported a 30 per cent incidence of the mass, Smith[21] a 35.8 per cent incidence, and Saint [20] reported the mass to be present in 100 per cent of cases. A few instances in which acute cholecystitis was due to volvulus of a long, loosely attached gallbladder have been reported;[1] likewise other cases have occurred which were thought to be due to primary bacterial invasion.[1,18] However, most observers are agreed that in the great majority of cases the cause of acute cholecystitis is obstruction of the cystic duct by a stone. In our series a stone was present in seventy-two cases (99.4 per cent), a figure not at great variance with the observations of others.[1,20] As pointed out by Saint[19,20] the result of obstruction of the cystic duct is an increased tension in the gallbladder, brought about by the continuous accumulation of exudate and transudate in its lumen. The tension may become so great as to cause gangrene of the gallbladder wall which may be followed with perforation. Thus the outcome is dependent upon relief of the tension. If the stone is dislodged by natural means, the accumulated fluid in the distended gallbladder may escape into the common bile duct. According to Saint[19] the most important single clinical manifestation that warrants immediate surgical intervention is a tender, palpable mass in the right upper quadrant of the abdomen. However, although thorough and oft-repeated examinations may bring to light a larger number of cases, it has been shown[16] that at times the mass may be the result of liver disease, muscle spasm or a gallbladder surrounded by omentum.

As indicated in Table I a tender, palpable mass developed within forty-eight hours of onset of acute symptoms in ten cases. Thus it is evident that acute cholecystitis may be rapidly progressive.

Advanced Acute Disease. In classifying the cases of advanced acute disease we have included those accompanied with gangrene, empyema, perforation with local abscess and perforation with generalized peritonitis. Of the seventy-six cases analyzed there were ten cases of empyema (13.1 per cent), twelve cases of gangrene (15.6 per cent) and nine cases of per-

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TABLE I

SEVENTY-SIX CASES OF ACUTE CHOLECYSTITIS GROUPED ACCORDING TO LENGTH OF TIME BETWEEN ONSET OF ACUTE SYMPTOMS AND OPERATION

	Group I, 16 Patients Operated upon within 48 Hours of Onset of Acute Symptoms	Group II, 17 Patients Operated upon within 48 to 96 Hours of Onset of Acute Symptoms	Group III, 22 Patients Operated upon within 4 to 8 Days of Onset of Acute Symptoms	Group IV, 21 Patients Operated upon within 9 to 29 Days of Onset of Acute Symptoms
Palpable mass..	10 (62%)	5 (29%)	7 (31%)	10 (47%)
Advanced acute disease.....	Gangrene 1 Empyema 1 Perforation with local abscess 1 Perforation with generalized peritonitis 1	Empyema 1 Gangrene with perforation and generalized peritonitis 2	Empyema 1 Empyema and gangrene 1 Gangrene 3 Perforation with local abscess 1 Gangrene with perforation and local abscess 2	Empyema 4 Gangrene 2 Abscess in wall of gallbladder 1 Empyema with perforation and local abscess 1 Empyema, gangrene, perforation with local abscess 1
Complications..	Total 4 (25%) Atelectasis and pneumonia 1 Pneumonia 1	3 (17%) Atelectasis 2 Atelectasis and pneumonia 1 Pyelonephritis 1	8 (36%) Wound infection 2 Biliary fistula 1 Local peritonitis, severe (clinical diagnosis) 1 Atelectasis 1 Bronchopneumonia 1 Postoperative jaundice which subsided 1	9 (42%) Wound disruption 1 Bronchopneumonia 1
Type of operation.....	Total 2 (12%) Cholecystostomy 1 (6.2%) Cholecystectomy 15 (93.8%)	4 (23%) Cholecystostomy 2 (11.7%) Cholecystectomy 15 (88.3%)	7 (31%) Cholecystostomy 1 (4.5%) Amputation of gallbladder 1 (4.5%) Cholecystectomy 20 (91%)	2 (9.5%) Cholecystostomy 3 (14%) Cholecystectomy 18 (86%)

foration of the gallbladder wall (11.8 per cent). Of the nine cases complicated by perforation six had become localized with abscess formation while in three cases generalized peritonitis had developed.

Glenn[10] in a review of the literature from 1934 to 1946 noted reports of twenty-five in-

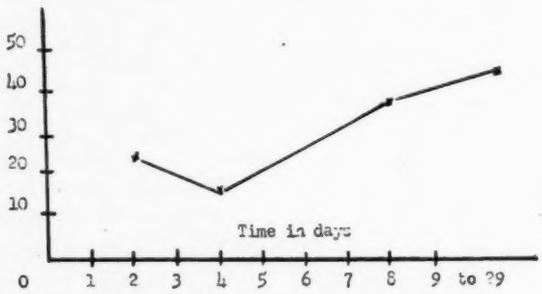

FIG. 1. Graph showing rising percentage of advanced acute disease as time passes.

vestigators covering 457 cases of perforation of the gallbladder in which the mortality rate ranged from 5.8 to 75 per cent. Smith[21] in a study of 332 cases of acute cholecystitis observed that 16.4 per cent were accompanied with gangrene while perforation was present in 9.1 per cent. Brooks and his associates[6] in an analysis of 110 cases noted gangrene in 36.3 per cent. Root and Priestly[17] in a study of 127 cases of acute cholecystitis found that the incidence of local perforation in cases in which operation was carried out later than one week after the onset of symptoms was 25 per cent, whereas of the number that came to operation within seventy-two hours after onset of symptoms 6.2 per cent showed evidence of local perforation. However, cases have been reported in which perforation has occurred within twenty-four hours of onset of symptoms.[7]

Table 1 shows the number of cases and types of disease in each group. Figure 1 illustrates the incidence of advanced disease rising with the passing of time; yet it will be noted that the three cases of perforation with resultant generalized peritonitis occurred in patients operated upon within ninety-six hours of the onset of acute symptoms.

Discrepancy between clinical signs and pathologic changes has been observed on different occasions.[4,7,11,16,19] Behrend and Gray[2] in correlating clinical, surgical and pathologic diagnoses in 200 cases noted wide variation. Bonn and Bachhuber[4] in a study of 427 cases in which the disease appeared to be subsiding clinically discovered acute lesions in 31 per cent. Thus it should be borne in mind that the apparent relief experienced by patients in many instances may be due to beginning gangrene; moreover, that a gangrenous gallbladder eventually will perforate.

Fever and Leukocytosis. In general it may be said that acute cholecystitis is associated with febrile reaction of varying degree and with leukocytosis. In the present study an average was taken of the figures representing the highest degrees of temperature recorded between the time of admission to the hospital and the time of operation. Therefore, the resultant figure, 102.6°F., is higher than a true average. Many patients had fever to only a minimal degree while in other cases the temperature rose as high as 105°F. Although the average leukocyte count was 16,337 with an average neutrophil count of 81 per cent, in one particular case in which the leukocyte count was 5,000 with 73 per cent neutrophils and the temperature 99.4°F. the gallbladder was gangrenous. Observation of cases such as this would indicate that it may prove dangerous to allow oneself to be guided entirely by the results of the laboratory examinations.

Complications. The incidence of complications in the surgical treatment of acute cholecystitis is rather high.[5,22,23] In our study complications which for the most part were pulmonary in nature occurred in fifteen cases (19.7 per cent).

Mortality. In the series of seventy-six cases there were no deaths. This fact can be accounted for to a great extent when one considers the age groups: only twenty-five of the patients were fifty years of age or more, the oldest being seventy-two years; eleven were thirty years of age or less, the youngest being twenty years. A mortality rate of 6.1 per cent in patients over fifty years of age, in contrast to 1.08 per cent in patients under the age of fifty, has been reported.[10] In an analysis of 1,960 cases Eliason and Stevens[7] demonstrated that the mortality rate in persons past the age of sixty is from eight to ten times higher than it is in persons of younger age. According to Blumberg and Zisserman[3] the mortality rate of acute cholecystitis is much higher among persons with diabetes. Glenn[9] has shown that changes in the vascular system, i.e., arteriosclerosis, hypertension and nephrosclerosis, apparently are more prevalent among persons with biliary

disease of long standing than among those not so afflicted. Moreover, it has been observed generally that the mortality rate of acute cholecystitis is at times rather high among persons under thirty years of age, this fact undoubtedly resolving itself in the hesitancy of many physicians to make such a diagnosis in so young an individual, with resultant delay of proper treatment.

In addition to the various factors associated with age prompt hospitalization and treatment after onset of acute symptoms appear to have a decided bearing on mortality. In a series of 159 cases analyzed by Barrow and Massie[1] the mortality rate (irrespective of the type of treatment employed) among the patients hospitalized within twenty-four hours of onset of acute symptoms was 3 per cent; among those entering the hospital within one to three days, 6 per cent; among those hospitalized later than three days after onset of symptoms, 10 per cent.

When to Operate. Lahey[12] has said, "To wait for biliary colic is to wait for late stages of biliary tract disease and the dangers of complications. If we could convince patients of the wisdom of having their diseased gallbladders and gallstones removed at a stage when few symptoms are present, and at a stage when they do not want it done, rather than at a stage when the symptoms are advanced and they are begging to have it done, fewer patients would die and many would avoid most of the undesirable complications." While undoubtedly this is true, opinions vary as to the most favorable time for operative intervention in the presence of acute disease. In general the opinions fall into three groups, namely, immediate, late and early. In the immediate group will be found those surgeons who operate within the first twelve to twenty-four hours of onset of acute symptoms for the reason that the tissues then are more likely to be free of inflammatory changes. However, few cases fall into this group since hospitalization often is delayed.

In the opposite group are the believers in the conservative or late treatment. Attempts to relieve pain and to correct fluid balance are made in the hope that the symptoms will subside, surgical treatment to follow in about two weeks' time.

In the third (and probably the largest) group fall those who favor early operation. By early operation is meant surgical treatment within the first three days of the disease.

Statistics on mortality and morbidity have been compiled by members of each of the three groups, and from their conclusions inflexible rules have been laid down. It is our belief that no dogmatic rule can be followed. In the present study the average period of time between the onset of acute symptoms and hospitalization was 3.8 days and the average period between hospitalization and operation 3.1 days, thus making the average period between onset of acute symptoms and operation 6.9 days. Obviously the time interval between onset of acute symptoms and hospitalization is too long; and although judgment must be used in each individual case, the second period probably represents unwise delay in some instances. Generally speaking we believe in fairly prompt surgical treatment, that is to say operation within the first three days of onset of the disease.

Fifty-nine (77 per cent) of the patients in our study previously had had symptoms suggestive of gallbladder disease. In many cases apparently one or more acute attacks had been experienced. Although in approximately 75 per cent of cases symptoms will subside under conservative medical treatment, it is impossible to determine beforehand whether or not a particular case belongs in that category. It has been well said that the knowledge that a patient can recover from an attack of acute cholecystitis can be a dangerous thing.

In any case acute disease of the gallbladder can be regarded as an emergency state and the patient should be treated accordingly. Immediate hospital care should be insisted upon although this does not mean that the patient necessarily will undergo surgery. Prompt measures, whether they be along the line of conservative medical treatment or surgical intervention, should be taken in all such cases if a complete recovery is to be made. Thus the first step in the management of acute cholecystitis is immediate hospitalization of the patient.

The diagnosis is confirmed by clinical evaluation plus any diagnostic procedure deemed necessary. Often a flat plate of the abdomen and an electrocardiogram are indicated since it has been observed that the three conditions most likely to confuse the diagnosis are perforated peptic ulcer, acute intestinal obstruction and acute coronary thrombosis.[5,6]

Adequate surgical preparation plus the judicious relief of pain and the correction and maintenance of fluid balance by means of parenteral

therapy are necessary phases of the treatment. While the patient is being prepared, he is also closely observed. If the symptoms subside within twenty-four hours, operation may be postponed. If, however, the symptoms subside slowly, remain essentially unchanged or increase in severity, immediate operation is indicated.

Operation. Fallis and McClure[8] made a study of 320 cases of acute cholecystitis in which the gallbladder was removed. On the other hand, there are those who recommend a two-stage operative procedure;[14] cholecystostomy is performed in the early stages of the disease being followed in approximately two weeks with cholecystectomy. Of the seventy-six cases studied by us cholecystectomy was carried out in sixty-eight (89.4 per cent) and cholecystostomy in seven (9.2 per cent). In one case the gallbladder was amputated.

In the absence of general or local contraindications cholecystectomy probably is preferable. If generalized peritonitis is present as a result of gangrene and perforation, simple drainage of the abdomen with cholecystostomy is recommended. However, in the case of gangrene and perforation with resultant local peritonitis and abscess formation the surgeon may choose between cholecystectomy and cholecystostomy. In these particular cases it sometimes happens that extensive adhesions and the protective omentum about the gallbladder render cholecystectomy hazardous. In the case of the very old patient or the patient who is a poor surgical risk cholecystostomy is indicated. In the critically ill patient with advanced disease when operation is mandatory simple drainage of the gallbladder by means of a small incision made under local anesthesia is expedient.

The risks associated with cholecystectomy are lessened if the gallbladder is removed from above downward. This technic permits of more careful dissection of the indurated tissues about the cystic duct and makes possible individual ligation of the cystic artery and duct.

Either jaundice or a history of recent jaundice was noted in seven of the seventy-six cases studied. In four of these the common bile duct was opened, stones being present in three cases. In one case in which choledochostomy was not performed jaundice developed postoperatively but subsided within a comparatively short time.

Jaundice in patients with acute cholecystitis is not due necessarily to stones in the common bile duct but may be the result of cholangitis, edema of the pancreas surrounding the bile duct or adenitis at the base of the liver. Of 159 cases reported by Barrow and Massie[1] jaundice was present or had been present in forty-one (26.3 per cent), yet of this number stones were found in only twelve cases (7.7 per cent).

The indications for opening the common bile duct are essentially the same as those for surgical treatment of chronic cholecystitis. Lahey[13] is a strong advocate of choledochostomy for the reason that if a stone in the common duct causes jaundice following cholecystectomy for the relief of acute cholecystitis, it is considerably more dangerous to reopen this type of abdomen than would be true in the case of chronic disease. Certainly, thorough palpation of the common duct should be done. It is good practice to aspirate bile from the duct. The presence of clear, golden yellow bile is a contraindication for choledochostomy.

SUMMARY AND CONCLUSIONS

The results of a study of seventy-six cases of acute and subacute cholecystitis are reported. The following conclusions were reached:

1. The presence of a tender, palpable mass in the right upper quadrant of the abdomen generally can be considered an indication for early surgical intervention.

2. The incidence of advanced acute disease in and about the gallbladder rises with the passing of time in a given number of cases. However, severe complications such as perforation with generalized peritonitis may develop within the first few days of onset of the disease.

3. There often is a great discrepancy between clinical signs and pathologic changes. In addition there is danger in placing too much reliance on the leukocyte count and the degree of fever.

4. The mortality rate rises with age. It is influenced also by promptness in the hospitalization and treatment of these patients after the onset of acute symptoms.

5. Complications are rather frequent. Since these usually are pulmonary in nature, they can be prevented to a great extent.

6. Since it is evident that acute cholecystitis may be a rapidly progressive disease, immediate hospitalization is urged in all cases. During the period of hospitalization close observation and

adequate surgical preparation of the patient are essential. In cases in which the symptoms fail to subside rapidly operation should be performed within the first three days of onset of the disease.

7. Cholecystectomy probably is the preferable operation in the absence of general or local contraindications. In the aged and debilitated patient and in the critically ill patient with advanced disease when operation is mandatory cholecystostomy under local anesthesia is expedient. The indications for choledochostomy are essentially the same as those for surgical treatment of chronic cholecystitis.

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USE OF ANTIBIOTICS AND CHEMOTHERAPY IN SINUS AND MASTOID INFECTIONS*

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THIS article will endeavor to show the importance of evaluating every case of otitis media and its complications individually and the danger in relying on chemotherapy and antibiotics alone as a cure-all for all mastoiditis and its complications. The promiscuous use of chemotherapy and its masking of symptoms were stressed in 1942[1] but antibiotics have come to the fore since and that experience deserves renewed reiteration.

Since the advent of chemotherapy and penicillin there has been some controversy concerning the treatment of otitis media and early mastoiditis. Before subscribing to any new form of treatment for a disease the mortality and morbidity of the previous forms of therapy should be compared. Acute suppurative otitis media as a rule is a self-limiting disease; 80 per cent of unselected clinic patients get well in less than four weeks. A higher percentage get well if the external auditory canal is kept clean, the mucosa of the nose shrunken and care is administered to the eustachian tube. The percentage of natural arrests is still greater if the disease is non-suppurative. A large per cent of cures attributed to chemotherapy and antibiotic therapy undoubtedly include such spontaneous regressions.

Since the advent of chemotherapy and antibiotics the classic signs and symptoms of the complications of otitis media are often disguised so as to render a positive diagnosis difficult. The promiscuous use of these drugs in cases of otitis media tends to delay accurate diagnosis and necessary surgical intervention. The delay in surgical intervention accounts for some of the serious complications and some of the present mortality of otitis. Daniel S. Cunning[2] noted that in 2,200 cases of otitis meningitis from 1901 to 1935 there were only sixty-six instances of recovery or a mortality of 97 per cent. Josephine Neal[3] of the New York City Department of Health collected 238 cases from 1910 to 1935, with a mortality of 95 per cent. In the Johns Hopkins Hospital from 1925 to 1935 not a single patient survived. At Manhattan Eye, Ear, Nose and Throat Hospital from 1926 to 1936 in 101 cases only two patients got well. In contrast, the present era has removed the dread of otitis and the most serious complications offer a better prognosis with the efficient antibiotics and proper surgery at the proper time.

The following cases are cited to show that undue reliance on drugs often delays necessary surgery, with a lethal outcome:

CASE REPORTS

CASE I. A five-month old female child entered the Mary Immaculate Hospital on April 15, 1948, with a swelling behind the left ear of one day's duration. The child had a temperature of 100°F., a cough for several days and tenderness over the antrum, in addition to a purulent discharge. The roentgenogram showed the left mastoid to be cloudy, a leukocytosis of 13,650, with 51 per cent polymorphonuclears and 48 per cent lymphocytes. The smear revealed Staphylococcus albus hemolyticus. The child received 35,000 units of penicillin every three hours, the temperature remained normal, the drainage from the ear stopped and the swelling subsided within nine days after admission. On the eleventh day the child died suddenly.

At autopsy the patient showed necrosis of the left mastoid grossly and microscopically, round cells, plasma cells and chronic bilateral mastoiditis. At consultation nine days before death when the child had the subperiosteal abscess, operation was advised.

CASE II. N. L., age twenty, had a right simple mastoidectomy on March 3, 1945. On June 18, 1948, his right ear began discharging profusely. Chemotherapy and penicillin were instituted in large doses. On August 14, 1948, he was again operated upon for a right secondary mastoiditis. Four days later his tempera-

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ture was 107.5°F. At this time he had chills lasting five minutes and a temperature of 105°F. which would intermit to normal. The opinion was expressed that "the boy has a lateral sinus thrombosis, and, unless the focus is removed, the antibiotics alone will be ineffective." The surgeon in charge was urged to do a jugular ligation. In spite of the tremendous doses of chemotherapy, penicillin and transfusions, the boy continued downhill, with temperature, chills and pallor. On August 27th the consultant was again called and felt that the jugular vein was not successfully ligated. The neck wound was reopened and the carotid sheath was intact. After ligating the internal jugular vein the lateral sinus was inspected and repacked and the boy made an uneventful recovery.

Case III. C. K., a fifty year old white female, presented a history of a running left ear for forty years and a chill that lasted five minutes. The patient refused hospitalization and the family physician treated her with large doses of sulfanilimide.

Nine days later this patient was admitted to the Queens General Hospital, lethargic, with nuchal rigidity, weakness of the right upper extremity and the movements were uncertain with tremor dysdiadokokinesia with the reflexes slightly more active than on the left. On June 11, 1939, the spinal tap showed 6,360 cells per cm., with 90 per cent polynuclears. Smear showed a few gram-positive cocci. At operation, immediately on entering the mastoid cortex, pus was seen coming from the region of the temporosphenoidal cavity and this was traced to the middle cranial fossa. A needle passed through the temporosphenoidal lobe obtained 30 cc. of pus. Pus was found in the antrum (otitic) as well as a cholesteatoma. The next day the spinal tap showed 7,400 cells with 87 per cent polynuclears. The left mastoid culture showed Proteus vulgaris. By July 16, 1939, the condition began to improve and on July 27th the neurologic examination was negative except for a central facial weakness and aphasia. Her spinal fluid cleared and on September 9, 1939, the patient was discharged and she has been well for the past ten years.

Case IV. A male, N. S., fifty-eight years of age, was admitted to Queens General Hospital on May 12, 1948, with a similar story and also a proteus organism. He had a running right ear for the past three years. A progressive stupor and lethargy gradually developed but no fever or chills and then mental confusion and generalized weakness. Pus was obtained from the right temperosphenoidal lobe during the needling of the brain for a ventriculography. The patient could withstand a modified radical mastoidectomy only. The right temporosphenoidal lobe was needled and a greenish pus was obtained. The abscess cavity was opened widely and appeared to measure 2.5 by 2.5 by 25 cc. It appeared to be well walled off. A No. 14 catheter was left as a drain. The wound was packed and the patient returned to the ward in very poor condition. The patient appeared to improve for about ten days when he began to show evidence of blockage again, with lethargy and unresponsiveness, despite the massive doses of penicillin, sulfadiazine and streptomycin. The patient suddenly went into a coma during irrigation of the abscess. The wound was reopened widely on May 28th and much necrotic brain tissue was gently suctioned from the brain cavity and a large Mosher basket sutured into the abscess cavity. Postoperatively he received large doses of penicillin and sulfadiazine. The patient was discharged on June 18, 1948, with only a minimal residual weakness of right hand.

The two instances of temperosphenoidal lobe abscesses cited failed to respond to chemotherapy and antibiotics alone and accent the need for surgical drainage.

Case V. A. F., a fifty-eight year old white male, was admitted to Mary Immaculate Hospital on February 15, 1950, in a critical condition with a clinical diagnosis of acute right-sided suppurative pansinusitis, with a probable early brain abscess. He had been ill at home for a period of three weeks. The sinuses disclosed an empyema of the right maxillary and frontal sinuses by x-ray. The right middle turbinate was infracted to establish drainage of the frontal sinus and the maxillary sinus was irrigated. The patient was given intravenous fluids and massive antibiotic therapy to which he responded promptly. On February 23rd he began to run a temperature once again and the antibiotics were increased but within twenty-four hours suppurative meningitis developed in the patient. The spinal fluid was positive for pneumococci. He did not show a satisfactory response so a radical right frontal sinusotomy was performed on March 1, 1950, at which time a pathologic break-through of the posterior sinus plate was found. The necrotic bone sur-

rounding this dehiscence was removed over an area equal to a half-dollar exposing the dura over the right frontal lobe tip. There was no extradural abscess present. The patient improved considerably postoperatively for thirty-six hours but then again ran a stormy course. On March 11th the right frontal lobe was once again exposed and the brain was needled in various directions until a large abscess was found and 35 cc. of frank yellow pus were aspirated. A No. 14 French catheter was inserted into the abscess cavity for drainage and irrigation with antibiotics. The postoperative course was stormy and the patient finally lapsed into a comatose state and died on March 20, 1950.

Autopsy revealed an acute brain abscess of the right frontal lobe, with complicating suppurative meningitis, generalized, secondary to suppurative right frontal sinusitis.

Case VI. M. S., a twenty-five year old female, was admitted on December 28, 1949, to Mary Immaculate Hospital, with headache and vomiting going back approximately six weeks. The patient was treated with sulfa and penicillin (amounts unknown) with a diagnosis of virus X. Vomiting subsided but a few days later the patient began to complain of severe frontal headaches and pain in the left eye which awakened her at night. Photophobia was present. Sinuses were x-rayed and blood count done, and both were reportedly normal. The past history was significant in that the patient complained of a chronic discharge from the right ear for a long period of time (exact duration unknown). On admission the temperature was 101°F. and the pulse rate 84. The general appearance was that of a well oriented, well nourished white female somewhat hard of hearing. The fundi showed bilateral papilledema. The reflexes were all normal except for a positive Kernig and Brudzinski. The diagnosis on admission was cerebrospinal meningitis and possible brain tumor. The urine was completely negative. There were 12,650 white blood cells with 84 per cent polynuclears and 16 per cent lymphocytes. The spinal tap showed an initial pressure of 460 mm. and was grossly turbid with a final pressure of 160 mm. of water. The cell count was 2,523 cells per cc., with 90 per cent polynuclears and 10 per cent lymphocytes. The protein showed 1,680 mg. per cent and the sugar and chlorides were 17 and 745 mg. per cent respectively. There was no growth on culture. The patient was placed on 100,000 units penicillin every four hours and sulfadiazine 15 gr. every four hours. The patient's temperature was normal for two days and she was fairly comfortable except for intermittent episodes of severe frontal headache associated with vomiting and increasing deafness. On the third day she was symptomatically well, with less resistance to neck flexion but persistence of bilateral papilledema. There were no focal signs of brain abscess. The spinal tap was repeated. The initial reading this time was 600 mm., varying to 300 mm. The cell count was 597 cells per cu. mm., with 90 polynuclears per cu. cm. and 14 per cent lymphocytes. A ventriculogram revealed no abnormalities and it was believed that this ruled out a focal brain abscess. An otologic examination revealed that the right ear (long history of discharge) had pus under pressure, in spite of chemotherapy and antibiotics, and it was thought that the true picture was obscured by chemotherapy and penicillin. The patient had a right chronic mastoiditis with an acute exacerbation and an associated meningitis that required surgical intervention. The presence of a mild facial paralysis was noted at this time. On the twelfth hospital day a radical mastoidectomy was performed and sclerotic bone was removed and the surgeon entered a cavity containing a considerable amount of pus which terminated in the region of the zygoma and the antrum. Necrotic bone and a cholesteatoma were noted leading to the middle ear.

Following operation the patient was kept on penicillin and sulfadiazine. The temperature remained elevated (99° to 102°F.) for two days but her general condition was good. The facial paralysis persisted but gradually decreased. The patient was discharged on the nineteenth hospital day.

Case VII. R. P., a thirty-nine year old white male, was admitted to Mary Immaculate Hospital disoriented with marked pallor and sweating. There was a history of acute bronchitis, pharyngitis and sinusitis one month prior to admission which responded well to local therapy and bed rest. Six days before admission the patient began to complain of pain in the right ear which gradually increased in severity. The patient was on sulfa drugs and penicillin. Five days before admission the drum membrane ruptured spontaneously, with relief of pain and a purulent discharge. The patient continued on chemotherapy and seemed to be fairly well when suddenly on the night before

admission he complained of severe frontal pain which persisted. The patient became semicomatose and disoriented. His temperature was 103°F., his pulse 96, his respiration 20. The right ear was filled with a purulent discharge. Marked nuchal rigidity was present. The patient was started on 500,000 units penicillin every three hours and 1 gm. of sodium sulfadiazine every four hours intravenously. A spinal tap showed a cell count of 3,505 cells per cu. mm., 100 per cent polynuclears, 9.0 mg. of sugar, a total protein of 432.0 mg. and 725 mg. of chlorides. The white blood cell count was 27,150, with 84 per cent polynuclears.

A diagnosis of acute purulent meningitis secondary to otitis media and mastoiditis was made. The mastoid was found to be necrotic with free pus and a small exposed area of dura was injected and red between the sinodural angle and the zygomatic area. The patient was continued on penicillin and sulfadiazine. The temperature remained elevated for ten days. When a spinal tap showed no abnormal findings, the patient was discharged and has been well since, with no evidence of a discharge from the ear.

Case VIII. J. M., age sixty-seven, was admitted on March 7, 1949, from a local hospital in which he had been treated for acute coronary occlusion and meningitis. He showed a stiff neck, a high temperature and a persistent frontal headache. The spinal tap showed a high cell count, mostly polynuclears. The smear revealed meningococci. He was given large doses of penicillin and the temperature became normal, but the patient went into a coma. He had a discharging ear for years. At an emergency consultation the ear showed pus under pressure, a sagging canal wall with perforations of the left ear and the firm opinion that this was a case of otitic meningitis was expressed. Surgical intervention on the right was favored although the x-rays showed nothing. The true clinical evaluation was masked by chemotherapy and penicillin. The culture of the spinal fluid was negative, possibly due to the chemotherapy; the culture from the ear showed staphylococcus. The spinal fluid showed 60 mg. of sugar, 195 mg. of protein and 103 mg. of chlorides. The cell count on March 18th showed 36,050 cells while after operation on March 10th the count was 450 cells. Four days later it was 298 cells and then the spinal fluid became clear. The x-ray showed sclerosis of the right mastoid. On March 31st the cortex was entered, the tegmen tympani was eroded and the brain herniated into the mastoid wound. The dura was covered with a fibrinous exudate. When the dura was incised, the spinal fluid was clear. The patient's condition did not warrant further procedure at this time and the wound was packed and left open with drainage well established. On April 1st a radical mastoidectomy was done and the patient made an uneventful recovery and was discharged on April 15, 1949, as cured.

Case IX. On June 13, 1950, J. M., a sixty-four year old female, was admitted with severe left-sided headache and a left earache. She was well until one week before admission when a severe head and chest cold, tinnitus and generalized headache developed. Boric acid and peroxide soaks were prescribed by a local physician as were also pills and penicillin. The patient progressed to a lethargic state and then went into a coma. On admission the temperature was 104.4°F., the pulse was 110, the patient was semicomatose but responded to painful stimuli. She was irritable and restless and disoriented. There was marked neck rigidity and reflexes were hyperactive. The pupils were equal and reacted. A purulent exudate was seen in left ear canal. A central perforation was found in the drum. No mastoid tenderness or swelling was evidenced. The sinuses and the mastoid bone showed no abnormalities on x-ray. The spinal tap on admission showed 1,700 cells with 90 per cent polynuclears, 10 per cent lymphocytes. The sugar was negative and extracellular diplococci, morphologically suggesting pneumococci, were seen. The patient was operated upon June 15th and a simple mastoidectomy was done for an acute hemorrhagic mastoiditis and meningitis.

This patient received on June 13th 1 million units of penicillin at once and 1,000,000 every two hours; sulfadiazine 5 gm. intravenously at once, 1 gm. every four hours; 500 mg. aureomycin orally every four hours; 500,000 units penicillin and ½ gm. aureomycin were given preoperatively. The patient improved and on June 26th the spinal tap was clear, with normal pressure and twenty-five lymphocytes per cu. mm. The patient was treated with large doses of penicillin, 200,000 units every four hours, plus supportive therapy. The patient was discharged on July 8, 1950, as fully recovered.

Case X. E. R. had evidence of an upper respiratory infection on June 17, 1950. After two days she complained of left earache and

headache. Her temperature was 105°F., the blood pressure was 200/90, the left ear was draining blood and pus; there was a sagging of the canal wall, and the following morning she was comatose. At this time her neck was rigid and a spinal tap showed 560,000 cells with 97 per cent polynuclears and the fluid coagulated. Immediately 500,000 units of penicillin were prescribed and 200,000 units every two hours. The next day the patient was operated upon and immediately upon entering the mastoid cavity the following was noted: (1) Necrosis of bone plus free pus, (2) pathologic exposure of dura extending from the left sinus dural angle to the temporosphenoidal lobe of the brain, (3) a pathologic exposure of the lateral sinus, (4) necrotic zygomatic cells, (5) the antrum filled with pus. The culture showed pneumococci Type III.

The patient was treated postoperatively medically with penicillin 200,000 units every two hours, sulfadiazine 4 gm. at once, 2 gm. every two hours, glucose 5 per cent intravenously, and sedation. The temperature dropped to normal within four days. The spinal tap three days after showed eighty cells. The patient improved rapidly and was discharged within ten days after admission.

COMMENTS

It is not the intention to detract from the obvious benefit and known advantages of proper dosages of chemotherapy and antibiotic therapy in the many cases of early mastoiditis or of meningitis of otitic origin. The purpose of the aforementioned cases is to call attention to the hazards of inadequate dosage and of undue reliance upon any form of therapy in the face of obvious progression and complication of a suppurative nature in otitic infections. The importance of the early recognition of a complicating meningitis, brain abscess or sinus thrombosis is obvious. The removal of a suppurative seeding focus, not responding to chemotherapy or antibiotics alone, is imperative.

The diagnosis of these complications has been rendered more difficult because of the variations in the known clinical picture produced by such drugs. Despite the disguising and confusing clinical course, which can follow as a result of drug therapy, the fundamental principles of diagnosis remain applicable. Each complication is distinctive in the general appearance, in the temperature curve and the spinal fluid findings. The dull, apathetic patient who has a brain abscess is in contrast to the anxious, restless victim of meningitis or the bright animation of the patient ill with lateral sinus thrombosis. The normal or subnormal temperature of the case of brain abscess differs from the continuous high temperature of the acute meningitic and this is easily distinguished from the picket fence curve of the infected thrombophlebitis. There still remains room for good clinical judgment and the determination of the exact pathologic disorder present rather than blind dependence on drug administration.

The diagnostic acumen of the otologist is now taxed to the extreme because of the masking of symptoms and the pathologic state by proximate alleviation of symptoms and signs by the drugs used while the causative pathologic disorder still remains unresolved. The abuse of the drug therapy by piddling dosage maintained for inadequate periods with premature cessation often does more harm than good by rendering the causative organism drug-fast and resistant. The boon of these powerful therapeutic agents is then lost to the patient when it is needed most for the more serious complications.

CONCLUSION

Ten cases demonstrating varying complications of otitic infection in the face of chemotherapy and antibiotic therapy are presented.

It is urged that the powerful therapeutic agents now available be used with discrimination. A specific diagnosis should be established, with due consideration for the known complications of mastoiditis. It is urged that adequate dosage be administered, with particular care to avoid premature cessation.

Suppurative foci, apparently not responding, should be exposed in keeping with the well established principles of otologic surgery.

Acknowledgment: I should like to express my sincere appreciation to the Attending Pathologist, Alfred Angrist, at Queens General Hospital, for his valuable cooperation in evaluating the pathologic findings.

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THE SURGICAL ANATOMY OF THE SPLENIC VEIN*

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THE recent trend in the surgical management of portal hypertension by splenorenal anastomosis necessitates a thorough knowledge of the anatomic variations of the splenic vein. A perusal of the literature reveals a paucity of detail and some confusion concerning this subject.

Gray's Anatomy[3] states that the lienal vein is formed by the confluence of five to six hilar branches. It receives four to five short gastric veins as well as the gastro-epiploic and the pancreatic. In 10 per cent of the cases it receives the inferior mesenteric vein in its terminal portion. Morris' Anatomy[9] mentions the origin of the splenic vein from several branches. The inferior mesenteric vein joins the splenic vein just before the latter unites with the superior mesenteric. Cunningham's Manual of Practical Anatomy[2] gives more detail concerning the branches as follows: The short gastric and left gastro-epiploic veins join the splenic vein near its origin or may join its hilar branches. The inferior mesenteric vein joins the splenic vein at any part of its last 2 inches, or it may join the commencement of the portal vein or the end of the superior mesenteric. Concerning the entry of the coronary vein there is considerable difference of opinion, some placing its entry into the portal (Gray,[3] Sobotta,[10] Cunningham[2] and Toldt[13]), others into the splenic (Hanrahan,[4] Spalteholz,[11] Paitre[6] and Piersol et al.[7]).

Ssoson-Jaroschewitz[12] in a study of the surgical anatomy of the hilum of the spleen discusses the relationship of the splenic artery and vein. In 60 per cent of instances the vein lay on the upper margin of the pancreas inferior to and parallel with the artery. Medially it turned downward on the lower border of the pancreas to enter the portal vein. In 38 per cent of instances the vein from its origin lay posterior to the pancreas some distance from the artery. In 4 per cent the vein lay on the superior surface of the pancreas throughout its length, with the artery superior and close to or some distance from the vein. In 78 per cent of cases the artery and vein did not cross each other. In the remainder the artery crossed anterior or posterior to the vein.

In view of the sparsity of detail presented in the literature this study was undertaken in an attempt to gain more accurate knowledge concerning the splenic vein and its tributaries.

METHODS AND OBSERVATIONS

Dissections were performed during seventy-five consecutive autopsies in which the portal tree was totally or almost completely intact following the removal of the organs by means of the Zenker block dissection technic.

The following points pertinent to the splenic vein were studied: (1) The number of the large hilar branches (outside the spleen); (2) its tributaries with their relative locations; (3) its relation to the pancreas; (4) its relation to the splenic artery.

Most of the dissections were performed from an anterior aspect. Ten cases, however, were dissected from the posterior aspect.

Hilar Branches. In all seventy-five cases the hilar branches could be demonstrated. (Table 1.) In one case only one branch was found, in twenty-seven cases two branches, in thirty cases three branches, in twelve cases

TABLE 1

No. of Branches	In No. of Cases	No. of Branches (Per cent)
1	1	1.3
2	27	36.0
3	30	40.0
4	12	16.0
5	4	5.3
6	1	1.3

* From the Departments of Pathology and Surgery of the Michael Reese Hospital, Chicago, Ill. This work is part of a project on veins, supported by grant H-37 (C-2) from the Federal Security Agency, Public Health Service, National Institute of Health. The Department of Pathology is in part supported by the Michael Reese Research Foundation.

four branches, in four cases five branches and in one case six branches.

Tributaries. In studying the tributaries with their relative locations it was decided, for purposes of convenience, to divide the vein arbitrarily into five parts. The first (proximal), called Sx, includes the hilar branches from the spleen up to the point at which they unite to form the main trunk. From this point to the point of union with the superior mesenteric and portal veins the vein is divided into four equal parts called respectively, S1 (proximal), S2, S3 and S4. The tributaries demonstrated were short gastric, gastro-epiploic, omental, pancreatic, inferior mesenteric and coronary. (Table II.) The short gastric was found in sixty-four of seventy-five dissections. In fifty-six cases it was found entering Sx (Fig. 1), or the most superior hilar branch, and in eight cases S1. (Fig. 2.) In three of the dissections there were two short gastric branches. (Fig. 3.) In the other sixty-one, however, only one main short gastric vein entered the splenic vein. The gastro-epiploic vein was demonstrated in fifty-six dissections. In ten cases it entered Sx (Fig. 2), in forty-three it entered S1 (Fig. 1) and in three it entered S2. (Fig. 3.) It entered as a separate tributary in twenty-three of the fifty-six dissections. In the remaining thirty-three it joined the omental vein to form a common trunk which then entered the splenic vein. (Figs. 1 and 2.) The omental vein was found in forty-four dissections. It was seen to enter Sx in seven cases (Fig. 2), S1 in thirty-five cases (Fig. 1) and S2 in two cases. (Fig. 3.) In thirty-three instances it formed a common trunk with the gastro-epiploic to enter the splenic vein (Figs. 1 and 2) and in the other eleven cases it entered the splenic vein as a separate branch. (Fig. 3.) The pancreatic veins were found entering the splenic vein throughout its course along the pancreas. They varied greatly in number and location and were demonstrated in all cases. The inferior mesenteric vein was demonstrated in twenty-six dissections. It entered the portal vein in fifteen cases. (Fig. 1.) In all cases it entered as a single vein. The coronary vein was demonstrated in fifty-one dissections. In sixteen instances it entered the splenic vein. (Fig. 3.) In the remaining thirty-five dissections it entered the portal vein. (Figs. 1 and 2.)

TABLE II

LOCATIONS OF TRIBUTARIES OF SPLENIC VEIN

Venous Tributaries	Point of Entry	No. of Dissections Demonstrated	No. of Branches into Splenic Vein
Short gastric	*Sx—56 or 87.5%	64	1 in 63 cases 2 in 3 cases
Gastro-epiploic	Sx—10 or 18% *S1—42 or 74% *S2— 3 or 8%	56	Forms common trunk with omental vein in 33 cases, or 59% Enters separately in 23 cases or 41%
Omental	Sx— 7 or 16% S1—35 or 80% S2— 2 or 4%	44	Forms common trunk in 33 cases Enters separately in 11 cases
Inferior mesenteric	*S4— 9 or 34% *Superior mesenteric vein* 2 or 8%	26	1 branch in all 9 cases
Coronary	Portal vein 35 or 68.6% S4 (splenic vein) 16 or 31.4%	51	1 branch in all cases

* For abbreviations, see text.

Relationship to Pancreas. In studying the relationship of the splenic vein to the pancreas we found it to be quite constant and as stated in Gray's Anatomy,[3] "It passes from left to right, grooving the upper and back part of the pancreas, below the lienal artery."

Relationship to Artery. The relationship of the vein to the splenic artery is, of course, dependent also upon the distribution of the latter. This is markedly variable. We studied a total of fifty-five dissections with this in view. In thirty cases or about 54 per cent we found

the artery to be totally anterior to the vein. (Fig. 1.) In twenty-four cases or about 44 per cent we found that the tortuous course of the artery carried it sometimes anterior and sometimes posterior to the vein. (Fig. 2.) In one instance we found the artery to be totally posterior to the vein. (Fig. 3, Table III.)

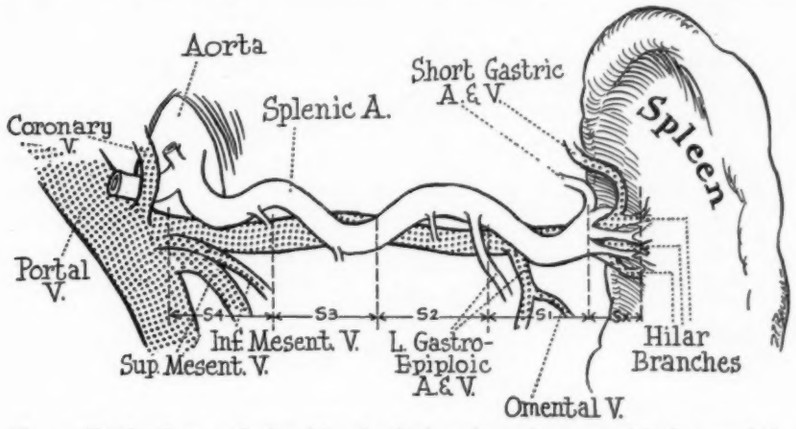

FIG. 1. Predominate relationship of splenic vein and artery with the usual site of entry of tributaries; anterior view. Note the three hilar branches, with the short gastric entering one of them, the gastro-epiploic and omental in common entering S1, the inferior mesenteric and coronary entering the portal. The artery is totally anterior to the vein.

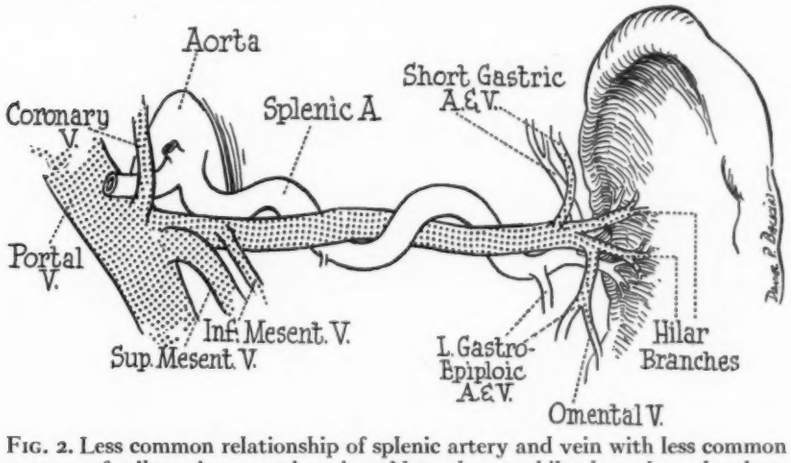

FIG. 2. Less common relationship of splenic artery and vein with less common pattern of tributaries; anterior view. Note the two hilar branches, the short gastric as one vein entering S1, the gastro-epiploic as a common branch with the omental entering Sx, the inferior mesenteric entering the splenic and the coronary entering the portal. The artery is partially anterior and partially posterior to the vein.

cases, being situated in part below and in part above it. In a lesser number the artery was in part anterior and in part posterior. Rarely the artery was totally posterior to the vein.

The entry of the coronary vein into the portal system assumes importance in view of the work of Blakemore and Lord.[1] According to the latter obstruction of the splenic vein requires a splenectomy and splenorenal anastomosis to eliminate esophageal varices. This is based on their belief that in most instances the coronary vein (which drains the esophageal vein) enters the splenic vein. We, however, have found that in the majority of instances the coronary vein enters the portal vein. Hence

COMMENTS

In contrast to the prevailing impression that there are five to six hilar branches we found only two to four in 92 per cent and two to three in 76 per cent of our cases. Contrary to Ssoson-Jaroschewitz[12] we found the splenic artery to be totally anterior to the vein in a majority of

from this standpoint esophageal varices should not occur in the majority of cases. However, Kegaries[5] and Quiring[8] pointed out that there are anastomotic channels between the short gastric veins and the esophageal veins and that varices of the latter may still occur in obstruction of the splenic vein even when the coronary vein empties into the portal vein. It is, therefore, possible that in the majority of instances in which the coronary vein enters the portal vein a splenectomy, including dissection and ligation of the proximal one-fourth of the splenic vein, will obviate the necessity of a splenorenal anastomosis. The latter is probably indicated only in the minority of instances in which the coronary vein enters the splenic vein proximal to the point of obstruction. Further experimental and clinical observations are necessary to reach more definite conclusions.

TABLE III
RELATIONSHIP OF SPLENIC ARTERY TO VEIN

Position of Artery to Vein	No. of Cases	Percentage of Total Cases
Totally anterior to vein	30	54
Partially anterior and posterior	24	43
Totally posterior	1	2
Total	55	

CONCLUSIONS

1. In the majority of cases there are two to four hilar branches of the splenic vein.

2. The short gastric veins empty into the superior hilar branch of the splenic vein in a majority and into the main stem of the splenic vein in a minority of instances.

3. The gastro-epiploic vein enters the proximal one-fourth of the main stem of the splenic vein in a majority and into the inferior hilar branch in a minority of cases. Less frequently it enters the second quarter of the main stem.

4. The omental vein enters the proximal quarter of the main stem of the splenic vein in a majority and into the hilar branch in a minority of cases. Less frequently it enters into the second quarter of the main stem.

5. The omental and gastro-epiploic veins join to form a common trunk entering the splenic vein in a majority of cases.

6. The inferior mesenteric vein enters the portal vein in a majority and into the splenic in a minority of instances. Less frequently it enters the superior mesenteric vein.

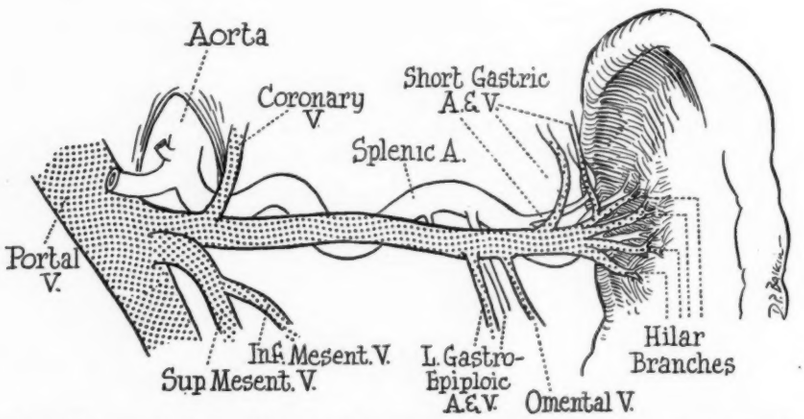

FIG. 3. Unusual relationship of splenic artery and vein with unusual pattern of tributaries. Note the four hilar branches, the short gastric entering as two separate veins into Sx and S1, the gastro-epiploic entering S2 as a separate branch, the omental likewise entering S2 separately, the inferior mesenteric entering the superior mesenteric and the coronary entering S4. The artery is completely posterior to the vein.

7. The coronary vein enters the portal vein in a majority of cases and into the terminal quarter of the splenic vein in a minority of cases.

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Cardiospasm occasionally occurs rather promptly after an acute emotional upset. Psychologic factors, therefore, are important and the surgeon should reassure all his patients that they will positively be cured. E. D. Davis stated that anatomic studies on an eight-week fetus convinced him that the enlarged and thickened folds found in the abdominal esophagus undoubtedly help to keep the esophageal lumen tightly closed so that gastric contents cannot regurgitate into the thoracic esophagus. For this reason it seems to me that Heller's operation and not resections of the narrowed esophagus should be the surgical therapy of choice when the Negus dilator is ineffective. (*Richard A. Leonardo, M.D.*)

STELLATE GANGLION BLOCK*

THE TISSUE DISPLACEMENT METHOD

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MUCH has been written about stellate block and the indications for this procedure. Yet it has not been adopted as universally as it should be. This is perhaps due to the general belief that it is a difficult and hazardous procedure.

FIG. 1. Stellate block; with the patient in a supine or semi-recumbent position and the chin slightly elevated, the index and middle fingers spread 1 or 2 cm. are placed along the medial border of the sternocleidomastoid muscle and against the sternoclavicular articulation. As they are pressed firmly perpendicularly into the neck the carotid pulsation is first felt at the fingertips, then along the volar surfaces as the neurovascular bundle is displaced laterally and the visceral bundle (thyroid gland, trachea and esophagus) are displaced medially. A high lung apex is displaced downward.

Interruption of sympathetic nerve impulses through the cervico-dorsal chain can be accomplished by infiltration of procaine solution into the region of the stellate ganglion and actual injection into the ganglion is not necessary.

The anatomy[1,2] and physiology[3] of the sympathetic nervous system in this region is well known, and the diagnostic and therapeutic value of temporarily interrupting these pathways of visceral pain and vasomotor impulses is well recognized.[4–7] Stellate ganglion block is useful in painful sympathetic dystrophies of the scalp,[8] face[9,10] and upper extremities,[11–16] in the post-coronary shoulder hand syndrome,[17] in early painful herpes zoster[18] and in painful thoracic visceral lesions,[19] particularly angina pectoris[20–22] and painful dissecting aneurysms of the upper aorta.[23–25]

Interruption of the vasomotor impulses by stellate block is invaluable in the treatment of reflex vasospasm,[26] associated with vascular injury,[27] embolism and thrombosis.[28,29] In functional and organic peripheral vascular lesions of the upper extremity such as Raynaud's disease and thromboangitis obliterans it is of diagnostic and prognostic value[30] and frequently of great therapeutic benefit.[31] In coronary thrombosis the pain impulses traveling through the upper thoracic cardiac nerves are interrupted,[19] and also interrupted are the vasomotor impulses responsible for the associated reflex myocardial ischemia.[22] It has been effective in selected early cases of cerebral thrombosis and embolism.[8,20,32–36] It is valuable in severe hyperhydrosis of the hands,[37–39] atrophic rhinitis,[40,41] sclerodactylia[9] and many other lesions of the tissues innervated.

In pulmonary embolism widespread reflex pulmonary vascular and bronchial spasm may cause death from a relatively small embolus. We have interrupted or decreased this reflex by immediate procaine stellate block. Many patients suffering with asthmatic crisis have experienced immediate and marked relief of symptoms.[42]

The necessity for more prolonged interruption has led to alcohol injection and surgical resection. The former is hazardous and complicated by neuritis and other post-injection sequelae. Although relatively safe if properly used in the lumbar region,[43] alcohol should never be used for stellate block. Surgical resec-

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tion is destructive and permanent and should not be employed until it has been proven by frequently repeated procaine blocks that the lesion is irreversible and that permanent interruption is necessary. In our series of over 1,500 injections on 400 patients, thirty-six have had as many as thirty stellate blocks. These were treated by injections, first at six- to eight-hour intervals, decreasing to every twelve hours, and then to a daily injection as needed in order to assure sustained interruption. More than 100 have had daily injections for one week to ten days. Many of these patients appeared to have an irreversible lesion, such as causalgia of three to six months' duration or sudden occlusion of the axillary or brachial artery with imminent gangrene of the hand. Single blocks were frequently adequate for diagnostic purposes or for the relief of intense vasospasm. Following a single injection painful lesions of visceral origin were occasionally relieved for several days or longer depending upon the underlying etiology. We have not hesitated to use bilateral stellate block especially in severe cardiac pain, massive pulmonary embolism or asthmatic crises in which blocking either side alone proved inadequate.

Descriptions of the various technics previously described for stellate ganglion block would only add confusion. There are several direct methods and these have been variously modified in an attempt to avoid important structures of the neck. There is a direct posterior approach[44–47] and an indirect posterior method with multiple bony contacts and changing needle positions.[48] A direct lateral approach[30] may be employed or the high lateral[33] or superior lateral route.[41] The more simple, direct, anterior lateral approach[49] has been modified by a retrovascular anterior lateral route[50] and by the use of multiple bony contacts,[51] changing needle directions[37,42] and by the descending infiltration method.[20]

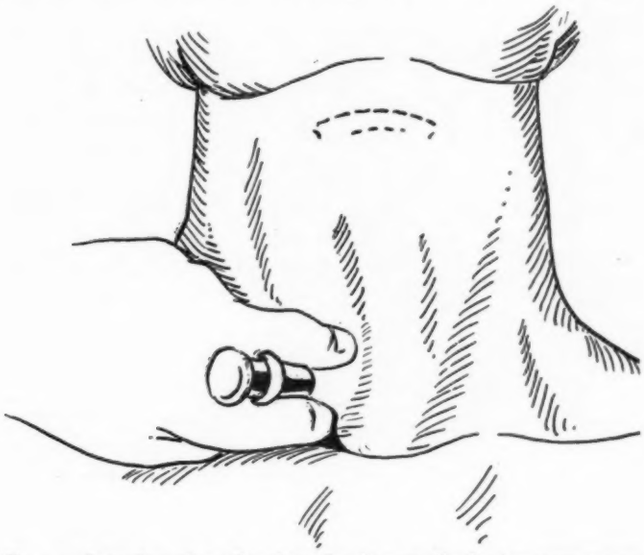

FIG. 2. Anterior view showing the fingers displacing structures in the neck as they contact the transverse processes and sides of the bodies of the lower cervical vertebrae for the direct injection of the stellate ganglion.

Many hazards have been stressed and accidents have been reported in which these techniques were used. The brachial plexus, pleura and lung may be punctured with annoying frequency. The vertebral and carotid arteries and internal jugular vein, and the dural space have been injected with serious results.[20,52]

The technic of stellate block as herein presented is simple, and with due caution it is relatively safe. It should be mastered by every physician who first sees these patients and is responsible for their care.

TECHNIC

The patient is placed in the supine or semi-recumbent position with the face directed straight forward. The chin is slightly elevated but not enough to put the structures of the neck under tension. One should stand at the side

which is to be injected with the middle and index finger of the left hand separated about 1 or 2 cm. and placed along the medial border of the sternomastoid muscle, and with the lower finger just above and against the sternoclavicular articulation. The finger tips are pressed slowly but firmly into the neck. (Figs. 1 and 2.) The carotid pulsation is felt on the volar surface of the fingers as the neurovascular bundle containing the common carotid artery is displaced laterally. The visceral bundle, consisting of trachea, esophagus and thyroid gland, lies against the dorsal surface of the fingers. The dome of the lung occasionally rising into the neck is thus displaced downward and the transverse processes and side of the bodies of the lower cervical vertebrae are felt by the finger tips. (Fig. 3A and B.)

All important structures are displaced in this way and the stellate ganglion in its position against the underlying bony surface of the body and base of the transverse process of the seventh cervical vertebra is brought into a subcutaneous position between the examining fingers where it can be infiltrated safely.

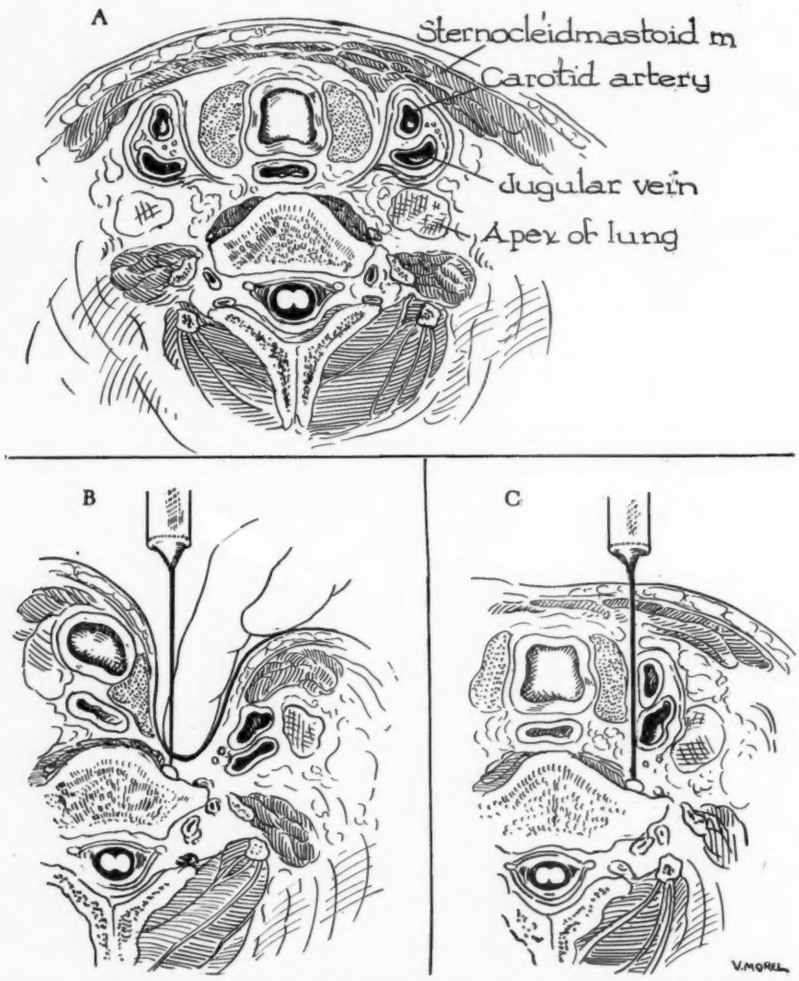

FIG. 3. A, Cross section at level of seventh cervical vertebra showing structures frequently penetrated by various approaches to the stellate ganglion; B, displacement of neurovascular bundle lateralward and visceral bundle towards opposite side bringing the stellate ganglion and sympathetic trunk into a subcutaneous position where it can be injected without danger to adjacent structures; C, withdrawing fingers from the neck permits structures to return to normal position as the skin slides along the needle shaft freeing both hands for the injection.

For this injection one should use 8 to 10 cc. of 1 per cent procaine solution without adrenalin. A 1½- or 2-inch fine gauge needle is used. It is

inserted perpendicularly into the region of the ganglion, encountering the solid bony base of the transverse process. If this is not encountered, the soft ligamentous tissue between the processes or the intervertebral cartilage may be recognized and the needle may be directed to a slightly higher or lower level.

The examining hand is then removed, allowing the structures to fall back into position as the depressed skin slides along the needle shaft. (Fig. 2c.) Thus both hands are free for the injection during which light contact with the vertebra should be maintained. When interruption of the upper dorsal ganglia and cardiac nerves is desired, the head of the bed or examining table should be elevated to permit the gravitation of the solution along the fascia planes.

The success of the block is indicated by the development within a few minutes of the signs of a Bernard–Horner syndrome, characterized by myosis, ptosis of the upper lid with narrowing of the palpebral fissure and injection of the sclera. The intensity reaches its maximum in ten to twenty minutes, at which time dryness and warmth of the hand, arm and side of the face may be noted.

This method has been satisfactory in patients of any habitus, although the stellate ganglion may be somewhat higher in the long than the short neck. The displacing fingers may be spread for a slightly higher insertion of the needle if Horner's syndrome does not immediately result; or if desirable, they may be carried lower in the neck and the needle directed more caudad for a direct injection of the first or second dorsal ganglia.

One is less likely to contact the vertebral artery or the brachial plexus by this method as the needle tip is more medial where it cannot readily pass between the transverse processes. The perpendicular direction of the needle avoids entrance into the intervertebral foramen. The usual precaution of aspiration before injection should always be observed.

We have used this method six years without a single failure in interrupting the sympathetic innervation and without important vascular or visceral damage. The technic has been mastered readily by the house staff and other physicians to whom it was demonstrated. It has proven simple, safe and consistently effective, and is much better tolerated by the patient than other methods now in use.

September, 1951

SUMMARY AND CONCLUSIONS

1. The slow acceptance of this valuable diagnostic and therapeutic procedure, in the face of increasing indications for its use, appears to be due to the technical difficulties associated with the methods previously described.

2. A method of stellate ganglion block is herein presented which avoids the complications common to other methods in use. It is readily mastered by the least adept and is well tolerated by the patient.

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SURGICAL MANAGEMENT OF ACUTE (SUDDEN) PERFORATION OF SIGMOID DIVERTICULA*

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RESECTION in diverticulitis when the formation of an inflammatory mass has occurred is now more generally accepted. There are many who are in agreement with a definite policy toward more radical surgery in diverticulitis. These investigators include Rosser, Jordan, Fansler, Bargen, Pemberton, Bacon,[1] Smithwick[2] and others. Paradoxically, despite the many generalities on the subject, there are extremely few cases of acute perforation of diverticula recorded.

By the term acute perforation we mean a sudden opening of a diverticulum with flooding of the abdomen with intestinal contents. This report is not concerned with those cases of relatively slow perforations that have gone on to abscess formation or to the formation of an inflammatory mass with contiguous structures. There have been many excellent reports of this latter type in most references on diverticulitis. There are but sparse and non-detailed discussions of the cases of diverticulitis with sudden perforations. This article is concerned only with the immediate management of acute perforative diverticulitis and with a somewhat different approach to this problem which was tried successfully in one case.

Smithwick[2] reported a 13.4 per cent incidence of acute perforation in a series of 545 cases of diverticulitis. He did not distinguish between sudden and slow perforation and of forty-two cases he reported ten deaths for a 23 per cent mortality. Morton[3] reported thirty-nine cases of perforation. However, only three of these were sudden in type, of which only two patients recovered. Other estimates have run from 2 to 25 per cent for acute perforations but again without differentiating between the sudden and the slow types. Martin[4] collected eight cases of acute perforation of 201 cases of diverticulitis which were culled from 177,718 admissions in eleven years to the New York Hospital. At Mt. Sinai Hospital we have been able to find only five cases during the past ten years, with two deaths.

In summary about 5 per cent of people over forty years of age have diverticulosis; of these 10 per cent have diverticulitis, of which about 2 per cent may have acute (sudden) perforation. Statistically there is an expectancy rate of 500 people of 10,000 over the age of forty to have diverticulosis. Fifty of the 10,000 persons will have diverticulitis and one of the 10,000 will have a sudden perforation.

Laufman[5] states, "The most dreaded, but fortunately the least frequent complication of diverticulitis is the sudden perforation of a diverticulum in the free peritoneal cavity which causes generalized peritonitis. This complication is rare because peri-diverticulitis usually serves to wall off the impending rupture by drawing loops of small bowel to the sigmoid or fixing the sigmoid to the lateral parietal peritoneum, bladder or anterior abdominal wall. Consequently, penetration and abscess result more commonly."

DIAGNOSIS

The diagnosis of sudden perforation of a sigmoid diverticulum is rarely made preoperatively. In the differential diagnosis a perforation of a viscus, foreign body perforation of the intestines or a volvulus may have been considered.

In retrospect one could conceivably have made the diagnosis in some cases. If the pain is on the right side with an atypical history of appendicitis, it may be impossible to make the diagnosis. Pain on the right side can easily be accounted for because the sigmoid is frequently in the midline or in the right lower quadrant. Left-sided pain associated with the signs and symptoms of acute peritonitis in the absence of a palpable mass with or even without a known history of diverticulitis would be an ideal situation for making the correct diagnosis.

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The symptom of backache should be stressed. LeRoyer and White[6] state that 20 per cent of patients with diverticulitis complain of low back pain. White and Jones[7] proved that by irritating the mucosa of the rectosigmoid one could establish pain referred to the lumbosacral region. In the case to be mentioned the patient complained of low backache for two years and had been studied completely from an orthopedic and neurosurgical standpoint, with no cause found. Since the operation he has had no complaints whatever referable to his back.

SURGICAL TREATMENT

Obviously our greatest responsibility in an acute emergency is to save the life of the patient with the simplest procedure. Incision and drainage is therefore the treatment of choice in acute perforative diverticulitis that has gone on to abscess formation. There is a great difference of opinion as to the surgical treatment of the acute (sudden) perforation.

Abell[8] states that an attempt should be made to repair the perforation, believing that the unsuccessful ones will develop fistulas. Rankin and Brown[9] recommend the removal of the perforated diverticulum, closing loosely with interrupted sutures and draining the peritoneal cavity. Erdmann[10] concurs.

Cornwell[11] believes that a perforated diverticulum should be handled as a ruptured ulcer or appendix, that is, by closure of the exit and drainage. Black[12] believes in exteriorization of the loop bearing the perforated diverticulum. Marshall[13] agrees and states that if the bowel cannot be exteriorized the involved segment can be anchored under the incision and drained down to the bowel. Bacon and McKay[14] state that the perforation should be located, closed and drained always with a transverse colostomy. Cave and Alsop[15] believe that closure of the perforation is not usually feasible and if attempted should have a complementary cecostomy.

Rankin in 1938 pointed out that a McBurney or a right rectus incision has often been made first because of the difficulty in diagnosis and the probability of appendicitis. He therefore suggests that if such an incision has been made it should be closed immediately and a low midline incision substituted for it. We agree with this.

At operation an abdomen full of free pus is usually apparent and upon examination of the sigmoid an indurated and friable inflammatory mass is found. Within this segment there is usually a large, open, freely draining perforation. Adjacent to or closely involved are a variable number of recognizable diverticula. There are five essential methods of treatment to be considered, as follows:

Drainage Only. This is usually unreliable because it depends on the spontaneous closure of the perforation and on the effectiveness of drainage of the peritoneal cavity.

Closure of the Perforation and Drainage. Technically it is usually impossible to do a fat graft or a closure with such friable tissue. It would be hazardous not to divert the fecal stream.

Closure and a Transverse Colostomy. Cecostomy is usually not considered as it does not completely defunctionalize the bowel. If a transverse colostomy is performed, hoping for a spontaneous or successful sutured closure of the perforation, additional procedures must eventually be carried out such as excision of the involved segment and closure of the colostomy. Emphasis should be made of the fact that an associated carcinoma can never be completely ruled out without removal of that portion of the sigmoid.

Exteriorization Procedure of the Mikulicz Type. The approximation of two inflammatory pieces of bowel can be dangerous because of the possibility of forming fistulas, abscesses and so forth.

Resection of the Involved Segment with the Proximal Loop As a Defunctionating Colostomy and with Exteriorization of the Distal Loop. This is the method we utilized in our particular case as it was technically feasible. (Fig. 1.) The following advantages were hereby attained: a relatively easy and quick technical procedure; the presence of an immediate defunctioning colostomy; actual visualization of the adjacent bowel for progressive healing and subsiding of the inflammation; actual removal of the diseased segment at the first operation which may contain unrecognizable carcinoma; no difficulties to be encountered later in attempting to resect a portion of bowel that is involved in marked adhesions; in chronic cases following a preliminary transverse colostomy, as in cases of fistulas, subsequent resection of the diseased sigmoid is often impossible because of the thick, hard, fixed, fibrous adhesions;

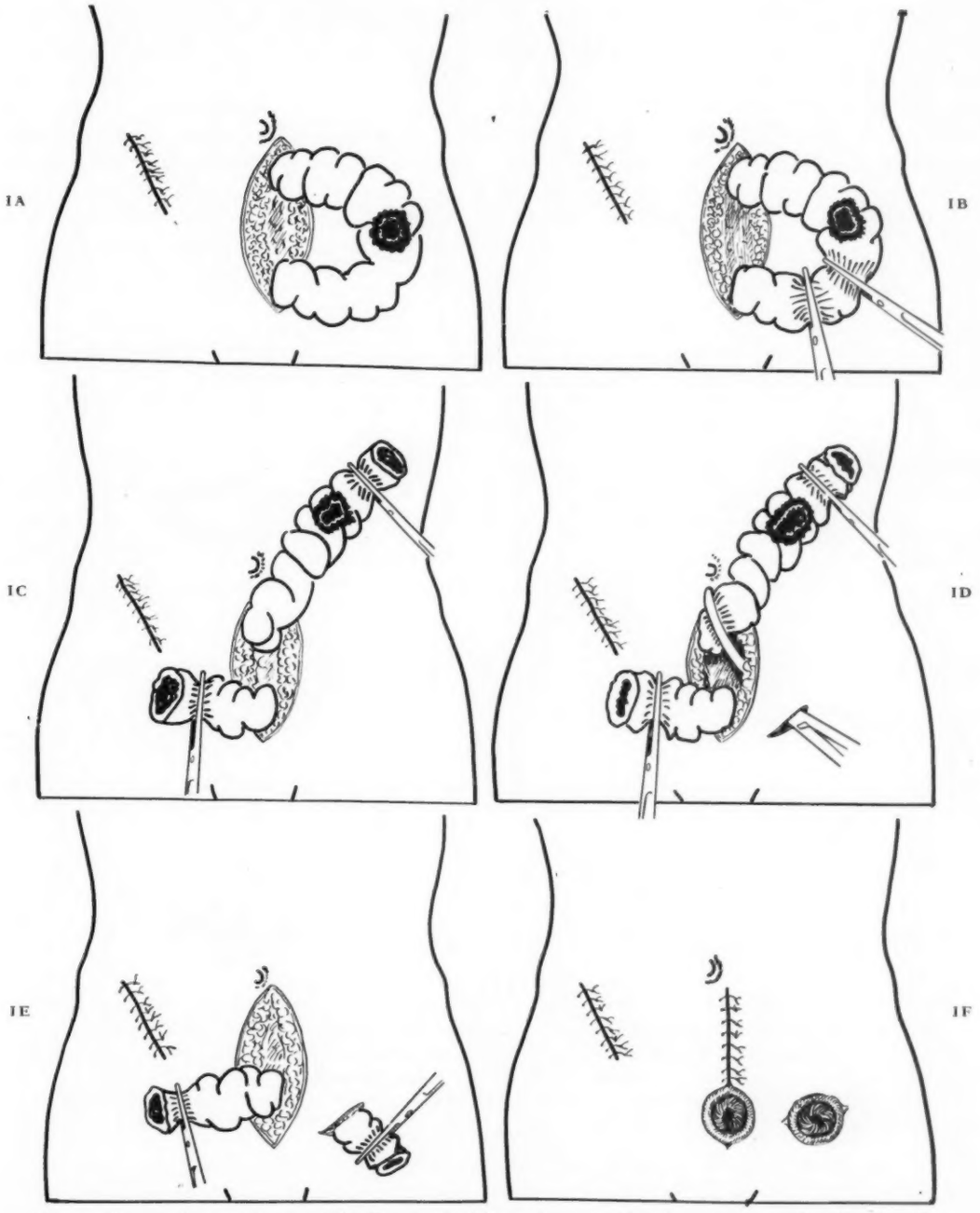

FIG. 1. Composite. A, closure of McBurney incision; through a left lower paramedian incision the loop containing the diverticula with the perforation is exteriorized. B, clamping the distal bowel. C, transection of distal bowel; an adequate wedge of mesentery is taken at this time. D, a small, lower left inguinal incision is made almost parallel to the lower margin of the wound; clamping of the bowel proximal to the lesion by an instrument through the small inguinal incision is shown. E, exteriorization of both loops of bowel after the segment of involved sigmoid has been excised. The proximal bowel serving as a defunctioning colostomy is visualized on the left side of the patient, the distal loop being shown on the right at the lower margin of the wound. F, diagram of the colostomy on the patients' left with the approximate position of the colostomy compared to the exteriorized distal loop; the intervening mesentery had been brought in contact with the underlying peritoneum.

easy closure to restore continuity of the sigmoid at an optimum time and accomplished extraperitoneally.

Our patient was a forty-five year old white male who had been ill for approximately four days. His preoperative diagnosis was acute peritonitis, probably due to a ruptured appendix. A McBurney incision had been made which was closed and the subsequent surgical procedure carried out was as described in Figure 1. The closure of the colostomy in the method described (Fig. 2) was performed five weeks after the first operation. The patient has been completely asymptomatic and a barium enema given seven months postoperatively revealed the entire colon to be without evidence of filling defects, diverticula or any demonstrable pathologic condition. The site of the previous resection and anastomosis was not identifiable. Lateral views of the rectum were normal and on air injection no diverticula were noted.

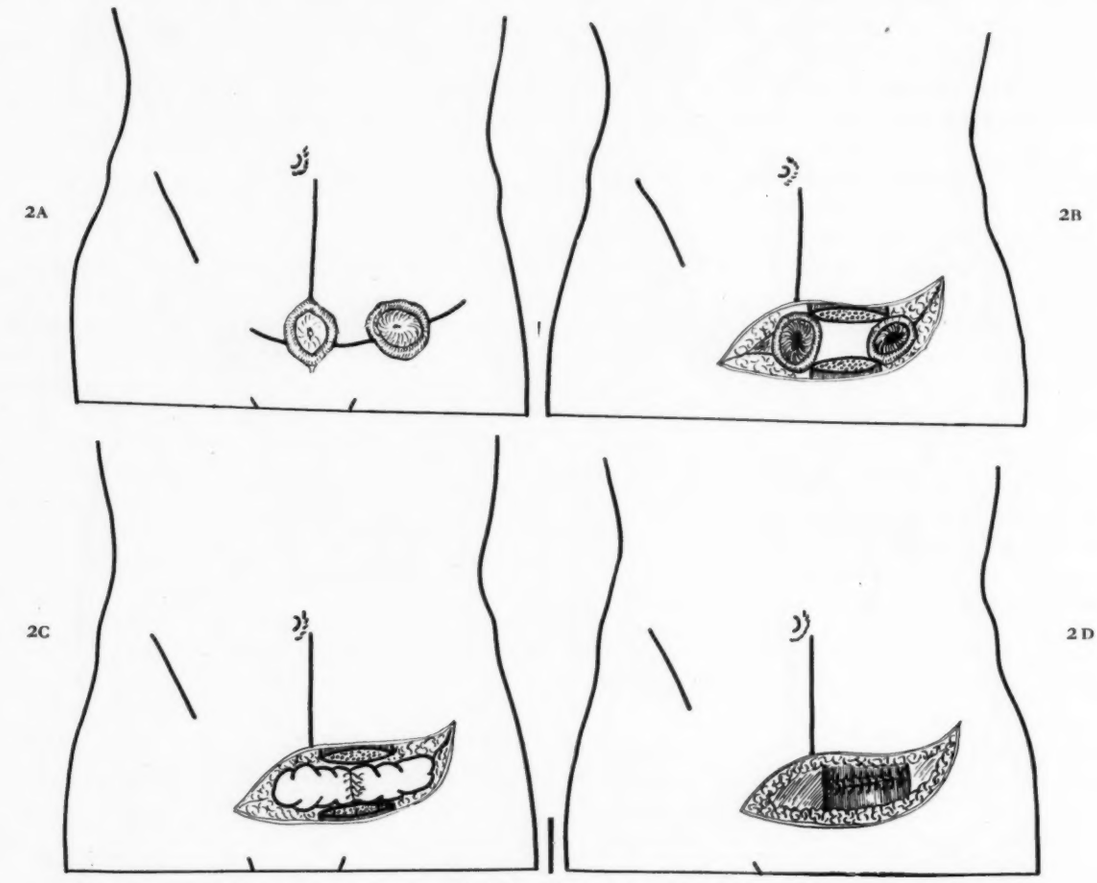

FIG. 2. Composite. A, transverse or slightly elliptical incision on both sides of the colostomies is shown. B, transection of the left rectus muscle. C, proximal and distal loops freed as much as possible and anastomosed extraperitoneally. This is accomplished below the semi-circular line so that there is no posterior fascia to hinder the closure. D, closure of the rectus muscle above the bowel.

SUMMARY

1. Acute perforations of sigmoid diverticula are divided into the relatively slow type and the sudden type. The former includes those cases that have gone on to abscess formation or to the formation of an inflammatory mass with contiguous structures. The latter includes acute perforations which have not been walled off and are followed with a free spill into the peritoneal cavity. It is with these sudden perforations that this article is concerned.

2. In mass terms we expect 500 of 10,000 persons over the age of forty years to have diverticulosis. Fifty of the 10,000 persons will have diverticulitis and one of the 10,000 will have a sudden perforation. It is difficult to

estimate the mortality but evidently in some series it has run as high as 50 per cent.

3. The importance of backache as a diagnostic symptom is discussed.

4. The different methods of treatment for sudden sigmoid perforation of diverticula are described. Another surgical procedure is suggested which may have distinct advantages when technically feasible.

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RUPTURE OF THE UTERUS

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THE incidence of rupture of the uterus has been steadily decreasing in reports from all clinics from 1900 to the present time. Craigin in 1916 in an analysis of 20,000 cases reported an incidence of one in 1,333 deliveries in the Sloane Maternity Hospital. Davis in 1927 reported twenty-eight cases of spontaneous and traumatic ruptures and twenty-four ruptures in old cesarean section scars in 91,208 confinements at the New York Lying-In Hospital from January 1, 1909, to September 1, 1926, an incidence of one in 1,754 deliveries. Sheldon reported twenty-six cases of uterine rupture in 47,554 deliveries at the Boston Lying-In Hospital from 1918 to 1934 for an incidence of one to 1,829. Bill, Barney and Melody in 1944 reported twenty-two cases of rupture of the uterus occurring in the years 1925 to 1941. In this group were 34,295 deliveries at the Cleveland Maternity Hospital and 21,096 patients confined by Maternity Out-Patient Department, a total of 63,391 cases. Rupture of the uterus in this group occurred once in 2,766 deliveries.

In the 101,127 deliveries at the Margaret Hague Maternity Hospital from October 12, 1931, to April 1, 1948, rupture of the uterus occurred thirty-nine times for an incidence of one in every 2,593 deliveries. The thirty-nine uterine ruptures are divided into three groups, namely, spontaneous ruptures fourteen cases, traumatic ruptures twelve cases and previous cesarean section ruptures thirteen cases.

SPONTANEOUS RUPTURES OF THE UTERUS

There were thirteen multiparas and one primigravida in this group. In the primigravida the rupture occurred at twenty-eight weeks' gestation in the right cornu of a bicornuate uterus. The past obstetric histories were of particular interest. The average gravidity was 5.4 and the average parity was 3.9. Ten of the fourteen patients were gravida v or more. Unfortunately the past obstetric histories in most of these cases were not too seriously considered until after the rupture occurred.

Complications of labor at time of spontaneous ruptures of the uteri were as follows: Bandl's ring, three; rapid normal spontaneous delivery of baby weighing more than 4,000 gm., three; abruptio placentae, two; pitocin injection followed with tumultuous labor, one; amnionitis (Welch bacillus infection), one; normal labor (ten to fourteen hours), two; and no labor (both in left cornu), two.

Type and Site of Rupture. According to Stander, "It is customary to distinguish between complete and incomplete rupture, according as the laceration communicates directly with the abdominal cavity or is separated from it by the peritoneal covering of the uterus or broad ligament." The former is more common in spontaneous and traumatic ruptures and the latter occurs more frequently in the rupture of previous cesarean section scars.

There were eleven complete and three incomplete ruptures in the spontaneous group. The site of rupture was the left cornu in two instances (both before labor) and the lower uterine segment (all during labor) in twelve instances. Of those ruptures in the lower uterine segment one case was anterior, two were of the right lower segment and nine were of the left lower segment. The two cornual ruptures occurred before the onset of labor, one in the left cornu of a bicornuate uterus at twenty weeks' gestation and the other through the left cornu at twenty-eight weeks in a patient who had a severe puerperal infection following her previous delivery. All twelve ruptures in the lower uterine segment happened during labor and there was an upward extension from a lacerated cervix in five of these twelve cases.

Maternal and Fetal Mortality. There were five maternal deaths in fourteen cases of spontaneous rupture of the uterus, a maternal mortality of 35.7 per cent. Twelve fetal deaths occurred, with a fetal mortality of 85.5 per cent. Laparotomy was performed upon twelve of the fourteen patients. Three patients died in this operative group, with a mortality of 25 per cent. Two other patients who were not operated upon also died.

Methods of Prevention of Spontaneous Rupture of the Uterus. A careful evaluation of the past obstetric history is necessary with special attention to the following: grand multiparity, cervical laceration, puerperal infection, abnormalities of the uterus, tumultous labors, difficult forceps or breech deliveries, surgery on the uterus and previous delivery of baby weighing more than 4,000 gm.

Long obstructive labors in multiparas should be prevented by a careful estimation of feto-pelvic disproportion in multiparas who fail to engage the presenting part after six to eight hours of labor with ruptured membranes. The multipara who previously easily delivered 7-pound babies may rupture her lower uterine segment if allowed to continue too long in labor with a 9-pound baby. Also, the pelvis which was adequate for the delivery of a 7-pound baby several years before may now be inadequate because of an exostosis on the inner aspect of the pubis or along the inlet. Two cases of exostosis causing inlet dystocia have been seen in his hospital in the last several years. The bony growth occurred between pregnancies and necessitated delivery by cesarean section of two patients who previously had had easy vaginal deliveries. The lower uterine segments were extremely thin in each case because the patients had long obstructive labors before the cause of the obstruction was detected.

Tumultous labor may be prevented by the use of adequate sedation and by employing caudal, spinal or general anesthesia. The rapid birth of large babies was the cause of spontaneous rupture in three cases in this series. The use of pituitary extract to stimulate or induce labor frequently causes tumultuous labor and it should be remembered that there are definite limitations of its use as suggested by Eastman. It should never be used on grand multiparas or patients who have had previous difficult deliveries or cervical lacerations. The initial dose should not exceed ½ minim or the maxim dose 1 minim.

TABLE 1

OPERATIVE PROCEDURES WHICH RESULTED IN TRAUMATIC RUPTURES

Operative Procedures	No. of Cases	Complete Rupture	Incomplete Rupture	Fetal Death	Maternal Death
Version and extraction	8	3	5	7	5
Forceps	1	1	0	1	1
Manual removal of placenta	1	1	0	1	0
Craniotomy	1	1	0	1	0
Manual dilation of cervix	1	1	0	1	0
Total	12	7	5	11	6

TRAUMATIC RUPTURES OF THE UTERUS

There was one primipara and eleven multiparas in this group. The rupture in the primipara was during a difficult mid-forceps rotation and delivery of a baby weighing 17 pounds. The size of the baby was definitely underestimated before the delivery was begun. The past obstetric histories were essentially negative except that the average parity was 4.8 and the average gravidity 6.6. All the parturitions were complicated before any traumatic rupture of the uterus occurred.

Complications of labor at the time of traumatic rupture of the uterus were as follows: compound presentation, four; face presentation, one; placenta previa, two; intrapartum infection (Welch bacillus), one; retained placenta, one; 17-pound fetus, one; and prolonged labor and disproportion, two.

There were eight ruptures of the uterus following version and extraction, with five maternal deaths. All of these ruptures happened between 1931 and 1941. During this time rupture due to version occurred eight times in 374 versions; the incidence of rupture, 1 to every 46.7 versions. Because of this experience it was decided that version and extraction in our clinic at least was a dangerous procedure. Since 1941 an occasional version has been done on the second twin for teaching purposes but this type of delivery is very seldom used on other cases. There have not been any uterine

ruptures due to version from 1941 up to April 1, 1948. (Table 1.)

Type and Site of Rupture. There were seven complete and five incomplete ruptures in this group. All traumatic ruptures of the uterus occurred in the lower uterine segment as follows: left lower segment five, right lower segment three, anterior lower segment three and posterior lower segment one.

Maternal and Fetal Mortality. In the twelve cases of traumatic rupture there were six maternal deaths for a maternal mortality of 50 per cent. Hysterectomy was performed in eight cases, with two maternal deaths, an operative mortality of 25 per cent. Four patients who were not operated upon died. Eleven of twelve babies were stillborn or died on the first neonatal day, a fetal mortality of 91.6 per cent.

Prevention of Traumatic Rupture of the Uterus. More careful supervision of the house staff and the definite limitation of the number of so-called emergency procedures have decreased the number of traumatic ruptures of the uterus. Permission is denied both the house and courtesy staffs to initiate any major obstetric interference unless some member of the attending staff is present.

The rapidly performed version because of a prolapsed cord or arm should not be permitted unless adequately supervised and the cervix found to be completely dilated. Irreparable damage can be done to the cervix and the lower uterine segment by attempting to complete rapidly a vaginal delivery in the often futile hope of obtaining a living baby.

Version and extraction, craniotomy on an unengaged head and manual dilation of the cervix are three very dangerous operations and their use in modern obstetrics should be definitely limited if not abandoned.

The strict enforcement of these regulations has markedly decreased the incidence of traumatic rupture in this hospital. There were eleven traumatic ruptures of the uterus in this hospital during 46,044 deliveries from October 12, 1936, to January 1, 1941, but there has only been one traumatic rupture in the last 55,083 deliveries from January 1, 1941, to April 1, 1948.

Extraperitoneal cesarean section for delivery of potentially infected cases should supplant craniotomy and manual dilation of the cervix.

TABLE II

SPONTANEOUS RUPTURES IN PATIENTS HAVING PREVIOUS CESAREAN SECTIONS

Type of Previous Cesarean Section	No. of Cases	Complete Rupture	Incomplete Rupture	Fetal Death	Maternal Death	Hysterectomy
Low transverse cervical	4	1	3	0	0	0
Low vertical	3	0	3	0	0	0
Classical	6	4	2	3	0	3
Total	13	5	8	3	0	3

TREATMENT OF SPONTANEOUS AND TRAUMATIC RUPTURES OF THE UTERUS

Early diagnosis, multiple transfusions and laparotomy, usually with hysterectomy, make up the treatment of spontaneous and traumatic rupture of the uterus. Of the twenty patients operated upon in these two groups there were five deaths, a maternal mortality of 25 per cent. All six patients who were not operated upon died, a maternal mortality of 100 per cent.

Multiple transfusions of adequate amounts of whole blood are imperative. It is believed that two of the deaths that happened in 1931 and 1933 might have been prevented by adequate replacement of whole blood. Intravenous infusions of saline, glucose or plasma are not substitutes for whole blood and their use should be limited to keeping the veins open until whole blood is available.

RUPTURE OF PREVIOUS CESAREAN SECTION SCARS

Of the thirteen patients in this group six had previous classical, three had low vertical and four had low transverse cervical cesarean sections. (Table II.) In six of the thirteen cases the rupture occurred after the patient had had

two cesarean sections; and in seven cases, after one cesarean section. In eight cases the patient had a morbid postoperative course following the previous cesarean section. Two cases were after non-morbid puerperium, and in three cases in which patients were operated upon in other hospitals the postoperative courses could not be ascertained. Of the six cases having previous classical cesarean sections, only one of which was performed in the Margaret Hague Maternity Hospital, there were four complete and two incomplete ruptures. In the complete ruptures all of the patients were in shock and three of them required hysterectomy. The tear extended upward and into the corpus in these four cases and severe hemorrhage took place. There were three fetal deaths in these six cases. Of the seven cases in which there were low segment operations there was only one complete rupture of the uterus and six incomplete ruptures.

The case of complete rupture following low segment operation occurred at thirty-seven weeks' gestation in a patient who had had two previous low transverse sections. Following the last section she had had a very morbid course. The patient did not have any uterine tenderness but she was admitted to the hospital in her thirty-seventh week of gestation because of vaginal bleeding. There was no abdominal pain and no rigidity. It was decided to perform an elective section because of the previous history of two cesarean sections, the morbid postoperative course and the possibility of placenta previa causing the bleeding. On opening the abdomen there was an opening in the lower uterine segment through which part of the placenta protruded. The placenta was attached to the lower segment of the uterus, continued out through the opening of the old scar and was firmly attached to the omentum over an area of 10 to 12 cm. The opening of the uterus was enlarged transversely and a living female child was extracted. The placenta was then separated from the uterus and the omentum and several bleeding points on the omentum were ligated. The uterus was closed and a Pomeroy sterilization performed. The blood loss of 500 cc. was replaced by a 500 cc. whole blood transfusion. The patient had two morbid postoperative days and was discharged on the twelfth day in good condition.

This case is presented in detail because it is the only case of complete rupture of the uterus which occurred in a lower uterine segment scar. Because of the attachment of the placenta to the omentum it was thought that this opening in the uterus was probably present from at least the third or fourth month of gestation.

In the other six cases following low segment operation there were small openings in the old scar through which the amniotic sac protruded. The sac was seen beneath the peritoneum, covering the serosa of the uterus. This portion of the peritoneum was part of the bladder flap which had been placed over the lower segment incision of the previous section. In three of the six cases the *patient was without symptoms* and an incomplete rupture was found at time of elective cesarean section before the onset of labor. In the other three cases there was *slight tenderness* over the old scar before operation. There was *no excessive* blood loss and *no evidence of shock* in the six cases of incomplete rupture in the lower uterine segment scars. There was no maternal death in any of the thirteen cases of rupture in previous cesarean section scars. There were three fetal deaths in six cases in which there had been previous classical operations; there were no fetal deaths in the seven cases that had lower segment operations.

Hours in Labor before Rupture Occurred in Cesarean Section Scars were as follows: before onset of labor six, in labor less than six hours none, in labor six to twelve hours three and in labor more than twelve hours four.

Of the six cases that ruptured before the onset of labor two occurred in a patient who had a previous classical section and the other four in cases that had two previous sections. Three of these six ruptures were complete, one occurring at thirty-three weeks' gestation, another at thirty-seven weeks' gestation and one at term. Of the three incomplete ruptures one was discovered at an elective operation at term and the other two occurred at thirty-eight weeks' gestation.

Effect of the Type of Previous Cesarean Section Scars on the Frequency of Scar Rupture and on the Maternal Morbidity and Fetal Mortality When Rupture Occurred. It is interesting that six of the thirteen ruptures occurred in patients with previous classical sections. Less than 1 per cent of the sections performed in the Margaret Hague Maternity Hospital since 1931 were classical sections. The majority of the patients who have come to the Margaret Hague

Hospital with histories of previous sections had the first section in this hospital.

I believe we can certainly conclude from these facts that classical scars rupture more frequently than the lower segment scars. Furthermore when rupture does occur in the previous classical scars, it is a much more serious complication. Four of the six ruptures in the classical scars were complete; four patients were in shock before operation; three required hysterectomy; and there were three fetal deaths. There was only one complete rupture in the seven lower segment scars. No patient was in shock before operation. No hysterectomies had to be performed and there were no fetal deaths. Rupture in a low segment scar is probably less frequent and is definitely less dangerous to the mother and child than is the rupture of the classical scar. The type of scar is one of the important factors to be considered in developing a plan of management for patients who have had a previous cesarean section.

Management of the Patient Who Has Had a Previous Cesarean Section. A careful history is to be obtained from the hospital chart of the previous cesarean section. The indications for the previous section, the hours in labor, the weight of the baby, the number and types of previous sections and the postoperative course are to be carefully evaluated. The patient's blood should be typed early in pregnancy and it should be cross-matched on her admission to the hospital. The patient should be instructed to notify her physician immediately if her membranes rupture, if she has any abdominal pain or tenderness or if there is any vaginal bleeding. The patient is admitted to the hospital one week before her expected date of confinement.

The patient is allowed a trial of labor if there is no evidence of fetopelvic disproportion, as determined by a careful pelvic examination and x-ray pelvimetry which should be done during the prenatal period, and the station of the presenting part during the last month, and if the patient had a non-morbid puerperium following the previous section and a primary indication for cesarean section is absent in this pregnancy.

Each case is individualized. An elective cesarean section is frequently performed upon a patient who had a morbid postoperative course following her previous section, on a patient who had a previous high classical section or on one who had two or more previous sections. However, of 336 cases in which the patients had cesarean sections in their immediate previous pregnancy currently being reviewed by Dr. Edith Mangone 37.5 per cent were delivered vaginally in the following pregnancy. Many of these patients had two or more vaginal deliveries following the cesarean section, so approximately 50 per cent of the patients who come to the delivery floor with a history of previous section are delivered vaginally.

It is true that we have had thirteen ruptures of previous cesarean section scars in 101,127 deliveries at the Margaret Hague Maternity Hospital in the last seventeen years. However, six of these ruptures occurred before the onset of labor so that only seven ruptures occurred during labor and only these can be directly attributed to the policy of giving previous cesarean sections a trial of labor. It would seem that the patient who had two or more previous sections or those who had classical sections should be carefully watched and should be sectioned electively or after a short test of labor as all the complete ruptures happened in these groups. But certainly the patient who has had only one previous low cervical section is entitled to a trial of labor and we believe this policy has been of value in keeping the cesarean section incidence in the hospital below 4 per cent. The fact that there has been no maternal death in the thirteen spontaneous ruptures of previous cesarean section scars is another good reason for the continuance of the present policy.

CONCLUSIONS

1. The grand multipara who has previously precipitously delivered large babies or who has been delivered vaginally by operative procedures is a potential candidate for a spontaneous rupture of the uterus.

2. Version and extraction, craniotomy on an unengaged head and manual dilation of the cervix are dangerous operations and their use in modern obstetrics should be limited if not abandoned.

3. Rupture of low segment cesarean section scars occurred less frequently than rupture of classical section scars.

4. Complete rupture of the uterus accom-

panied with shock, with increased danger to the mother and requiring hysterectomy, is more common following rupture of classical than low segment scars.

5. A previous low segment cesarean section with a non-morbid puerperium is not a valid contraindication to a trial of labor, with possible vaginal delivery in a subsequent pregnancy.

6. Early diagnosis, immediate operation and the rapid replacement of any blood loss with adequate amounts of whole blood are the three most important steps in the treatment of rupture of the uterus.

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Patients with Parkinsonism and other neurologic lesions that leave them with marked tremors and choreoathetosis can often be benefited by surgical means. Usually an operation has to be performed on various pathways in the spinal cord, or part of the cerebral cortex has to be extirpated, especially that portion which reproduces the abnormal involuntary movements upon electrical stimulation (operation performed under local anesthesia). In other cases structures in and around the basal ganglia have to be destroyed. Results are effective but often these patients are left with permanent paralysis of an arm or leg, occasionally even hemiplegia. (*Richard A. Leonardo, M.D.*)

URETHRAL DIVERTICULUM IN WOMEN*

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PRACTICALLY all the articles on urethral diverticulum in women published in the past ten years have been written by urologists. Because of the nature of the presenting symptoms it is the gynecologist who most often encounters and diagnoses these cases. The gynecologist, familiar with vaginal anatomy and surgery, is usually better equipped to carry out the operative procedure for its cure.

Urethral diverticulum may be defined as a sacculation formed by a dilatation of a circumscribed area of the posterior wall of the urethra, usually in its distal portion. The sac communicates with the urethra through an opening which may be single or multiple, narrow or wide.

The etiology of urethral diverticulum is a controversial matter. Congenital types may occur but they are probably rare. Most cases are considered to be acquired and are the result of infection or trauma, including obstetrical trauma, or both.[5,11,13,19] Urethral stricture or stone[2,4,6] at times may predispose to infection and thus contribute to the formation of a diverticulum. Furniss suggested that back pressure occurs at each voiding and that this hydrostatic influence gradually further distends the sac. The back pressure may be caused by stricture of the urethra or may be due to the natural narrowing at the external meatus where the diameter of the urethra is smallest. No definite criteria have been established by which a congenital diverticulum may be distinguished from an acquired one. Although the pathogenesis is not entirely clear, it is probable that the sequence of events in most cases closely follows the concepts laid down by Dr. Amand Routh[19] in a report to the London Obstetrical Society in 1890: (1) closure of the ducts of preexisting urethral glands, retention cysts resulting; suppuration and ulceration into the urethra by a small, often valvular, hole followed; the inflammation was kept up by urine trickling into the sac at each act of micturition; (2) blood cysts which had passed through similar changes; (3) the formation of pseudocysts by injury to the urethral floor during labor or instrumentation.

Histopathologic study has not contributed much to the understanding of this problem. The sac may be lined by any of the types of epithelium normally found in the urethra: i.e., stratified squamous, columnar or transitional, or may only contain granulation or fibrous connective tissue.[15] The wall of the sac may be thin or relatively thick and it may or may not contain smooth muscle.[11] The question has been raised in recently published articles as to whether a diverticulum is true or false, the determining factor being the presence or absence of a definite muscularis when examined histologically. An epithelial lining of the sac is also essential if a diverticulum is to be regarded as a true type. This measure may be unreliable as infection frequently erodes and completely removes the epithelial lining of the sac.

The female urethra, like the lower part of the rectum, is firmly embedded in the vaginal wall and cannot easily be dissected free from it.[7,8,18] The perivesical and perivaginal endopelvic fascias end abruptly at the urethrovesical junction so that there is no avascular space between the urethra and vagina such as is found between the bladder and vagina. The smooth muscle coats of the urethra are continuous with those of the bladder and consist of an inner longitudinal and an outer circular layer. Striated muscle fibers intermingle with the smooth muscle of the urethra. The muscle layers of the urethra and vagina are closely woven together by interlacing strands of connective tissue, and no line of separation can be found similar to that between the vagina and bladder. A vascular venous network called the corpus spongiosium urethrae is present in the submucosal areolar tissue separating the mucosa from the muscle layers. There is no unanimity of opinion on the subject of paraurethral glands and ducts. Hugh Cabot,[1] on the

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one hand, holds that there is no evidence of true glands in the proximal two-thirds of the female urethra. On the other hand, Lawrence R. Wharton discussing Virgil Counseller's[3] recent study stated, "I myself doubted the existence of periurethral glands (excluding Skenes) until I read the article by Dr. Huffman[10] presented before the American Gynecological Society one year ago. It is difficult to doubt the existence of periurethral glands after studying Dr. Huffman's work." It is generally believed that scattered mucous glands are situated for the most part in the distal portion of the floor of the urethra and diminish in number towards the bladder.

The anatomic relationship of the diverticulum to the urethra and vagina is of considerable surgical importance. The fusion of the vaginal and urethral muscle layers without a natural cleavage plane between these structures confines a urethral diverticulum to the region of the urethra and prevents dissection between the bladder and vagina as is frequently the case with other vaginal cysts.

It is possible that a diverticulum may develop in one of two ways. First, it may expand in the submucosa of the urethra and diffusely stretch the underlying fused smooth muscle of the urethra and vagina without breaking the muscular continuity. If the diverticulum develops in this fashion, it may dissect either posteriorly or to either side, displacing the urethra in the opposite direction. In operating on such a diverticulum it should be emphasized that the sac may completely dissect the smooth muscle free from the urethral mucous membrane and its submucosa. The operative field in this region is in a highly vascular area, the corpus spongiosum urethrae, where bleeding is usually profuse and troublesome.

Second, the sac may herniate through the muscular layers, carrying the muscle as part of its wall. In such cases the sac may be located directly beneath the vaginal mucous membrane and here surgical dissection is likely to proceed smoothly without much bleeding.

The most frequent presenting symptom is a sense of a mass in the vagina. The symptoms may include any of the complaints commonly associated with lesions of the lower part of the urinary tract, such as dysuria, incontinence and frequency.[6,21] Since infection is common, pressure over the mass causes a discharge of urine and pus from the external urinary meatus.

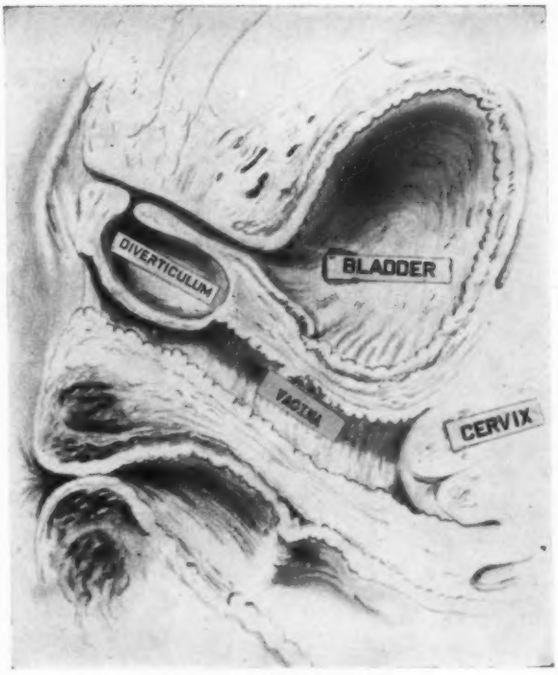


FIG. 1. Sagittal section.

Vaginal pain, discharge and dyspareunia may be present. Occasionally the diverticulum is asymptomatic and is found on routine vaginal examination.

The diagnosis is not difficult to make if the condition is borne is mind. The symptoms and the presence of an anterior vaginal wall mass should suggest the diagnosis of urethral diverticulum. The expression of urine and pus from the urethra by pressure on the mass is pathognomonic.

Corroboration is obtained by urethroscopy and urethrography. The opening of the sac is usually found in the posterior wall of the urethra in its distal portion. X-ray visualization may be obtained by injection of a contrast medium (5 to 10 per cent aqueous solution of sodium iodide or 60 per cent hippuran in jelly) into the meatus of the urethra or directly into the mouth of the diverticulum. Young and McCrae[22] recommend filling the bladder with radiopaque material and then taking x-rays while obstructing the external urethral orifice as the patient attempts to void.

Many methods have been suggested for the treatment of urethral diverticulum. Among these have been incision and cauterization of the sac,[22] invagination and obliteration of the sac,[12,16] transurethral enlarging of the orifice of the sac, and irrigation of the sac with anti-

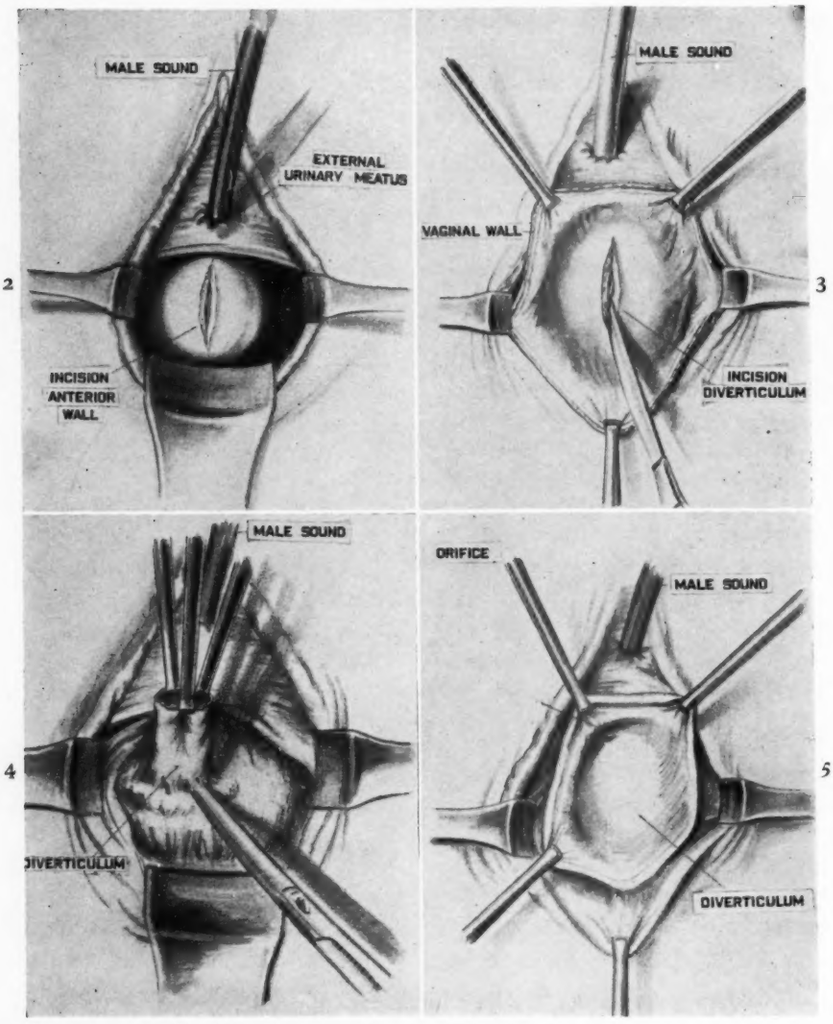
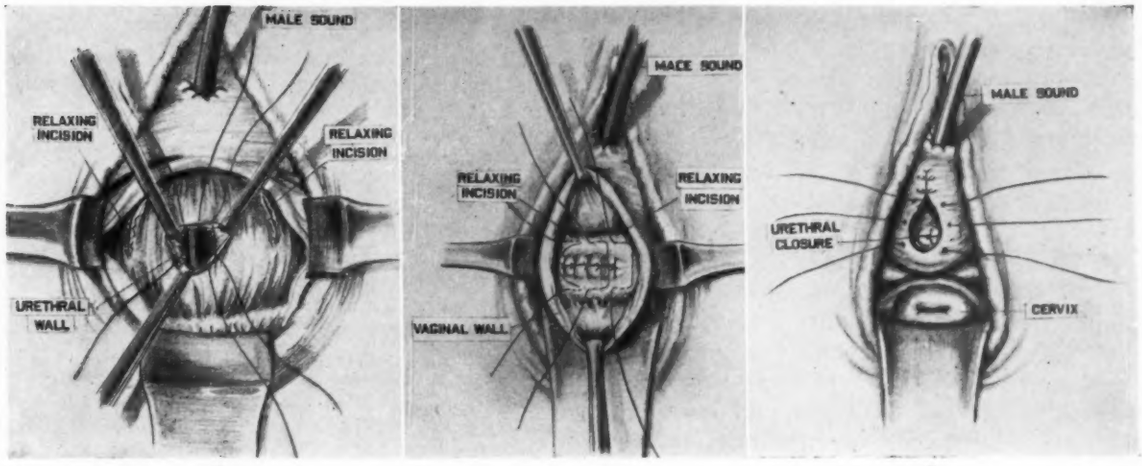


FIG. 2. Vertical incision into anterior vaginal wall.
FIG. 3. Vaginal wall opened and dissected free from the diverticulum; a vertical incision into the diverticulum.
FIG. 4. Sac of the diverticulum is opened; note the orifice into the urethra.
FIG. 5. The diverticulum is opened and is being dissected free from the urethra and vagina.

septic solutions. However, it is well accepted that the procedure of choice for cure of this condition is excision of the sac through an anterior vaginal wall approach.

Preoperatively the patient should have cysto-urethroscopy and cysto-urethrography performed to confirm the diagnosis, rule out concomitant bladder pathologic disorder and give information as to size, contour and location of the sac and the position of the urethral opening of the diverticulum. Cultures of both urine and discharge should be made and appropriate antibiotic therapy instituted. In the event that a resistant infection is encountered it is probably best to perform a suprapubic cystostomy prior to diverticulectomy or vaginal cystostomy at the time of operation.

At operation a No. 26 male urethral sound is first inserted through the urethra into the bladder. A midline incision is made in the anterior vaginal wall from a point about ¾ cm. below the external urinary meatus to just beyond the limit of the diverticulum inferiorly. The incision is deepened down to the sac wall and the diverticulum dissected free on all its sides, bearing in mind the surgical anatomy



6 7 8

FIG. 6. The diverticulum has been amputated from the urethra; closure of the urethra has been started, avoiding urethral mucous membrane. Note subpubic relaxing incisions.
FIG. 7. The urethra has been closed in two layers.
FIG. 8. Closure of the vaginal wall after redundancy has been excised.

previously described. It may be expedient in some cases to open the sac in order to carry out the dissection completely. The sac is dissected down to its urethral attachment and is then excised by cutting through its neck flush with the urethra thus creating an opening into the urethra. Sims' principles[20] for the repair of fistulas should be observed and tension on suture lines avoided. In order to obtain better mobilization and reduce tension the urethra is then freed from its attachments to the inferior borders of the pubic bones as described by William Kennedy[14] in his treatment of urinary incontinence. The opening produced in the urethra by the excision of the sac is closed with one or two layers of interruped No. oo or No. ooo chromic catgut atraumatic sutures passed anteroposteriorly so as not to narrow the urethral lumen. Care should be taken not to include the urethral mucous membrane.[9] The redundant vaginal wall is excised and the edges approximated with interrupted fine chromic catgut sutures. A retention catheter is inserted and the vagina packed lightly with vaselinized gauze. If trained personnel are available, careful repeated catheterization may be more desirable than the use of an indwelling catheter. (Figs. 1 to 8.)

Chemotherapy is continued postoperatively. If a retention catheter is used, it should be allowed to drain continuously or be released at least every three hours. There is no contraindication to early ambulation.

SUMMARY OF NINE PATIENTS OPERATED UPON*

The average age was twenty-five to forty-five years. Six patients were of the white race and three of the colored. Parity was as follows: para I five, para III two, para IV two. Symptoms included painful vaginal swelling six, vaginal discharge three, urethral discharge two, dyspareunia two, urinary incontinence four and dysuria two. The duration of symptoms was two and one-half months to four years. The physical findings were anterior vaginal wall bulging mass; pressure on mass caused pus and urine to be expressed from the meatus. The operations performed were urethral diverticulectomy—retention catheter eight and urethral diverticulectomy–suprapubic cystotomy one.

The postoperative course was uneventful, except for transient cystitis in two cases. Pathologic examination revealed granulation and fibrous connective tissue one, transitional epithelium two, squamous and transitional epithelium one, transitional epithelium and granulation and fibrous connective tissue one, granulation tissue two, fibrous connective tissue, transitional epithelium, squamous epithelium one, sac not examined, tissue lost; no

* One of these patients was previously operated upon by invagination and obliteration of the sac according to the Hyams method with no relief of symptoms and with recurrence of the diverticulum. She was reoperated upon three months later and diverticulectomy was performed. This case was reported in 1942.[17]

pathologic report one. There was a follow-up of fourteen months one, fifteen months one, eighteen months three, three years one and four years two. Asymptomatic and good anatomic result in all cases was reported.

SUMMARY

1. Diverticulum of the female urethra is more common than has been suspected and probably has been frequently overlooked.

2. The presence of an anterior vaginal wall mass and associated symptoms suggest the diagnosis. Expression of pus and urine from the urethra by pressure over the mass is pathognomonic.

3. Confirmation is obtained by urethrography or urethroscopy or both.

4. Pre- and postoperative antibiotic therapy as indicated by culture is recommended.

5. An operative procedure for the cure of urethral diverticulum is presented with a discussion of the related anatomy.

6. Nine cases are shown in which the patients were successfully treated with the operative procedure suggested.

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ABDOMINAL PREGNANCY*

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ALL of the eleven cases in this series are thought to have been secondary abdominal pregnancies. In only one case did both tubes and ovaries appear grossly normal and the available evidence in this case is not sufficient to warrant any claim that it was a primary abdominal pregnancy.

The period of gestation in four of the cases in this series is less than twenty-eight weeks. The trend in recent articles on abdominal pregnancy has been to disregard these early cases. I do not believe that this is an altogether correct viewpoint for the following reasons: (1) The diagnosis of abdominal pregnancy may be more difficult to make in the early cases. (2) The early cases may present somewhat the same problem of placental management. (3) The placental management in an early case with a live fetus may be more of a problem than in a late case in which the fetus has been dead for a period of weeks or even months.

It is true that in dealing with cases in which degeneration of the placenta has not taken place it can be safely removed in a higher percentage of the early cases. Therefore, I believe that the four cases in this series in which the period of gestation was less than twenty-eight weeks are worthy of being reported and discussed.

Four of the eleven cases in this series have been previously reported by Beck, Jewett, Matthews and the author.

It is apparent from the relatively large series of late extrauterine pregnancies reported by some authors that the incidence of this interesting type of gestation is entirely different in some hospitals and communities than in others. Analysis of these reports indicate that this difference is dependent upon such factors as race, the promptness with which patients having such symptoms as pain and bleeding early in pregnancy seek medical attention, and the significance that is given to these symptoms by the physician consulted.

This series of cases was observed in the hospitals of Brooklyn with which I am associated, namely, Kings County, Long Island College and Norwegian Hospitals. There were six cases on the Long Island College Division, Kings County Hospital, during an eleven-year period from 1939 to 1950. Our service at that institution receives one-half of the total obstetric and gynecologic admissions. (Table I.) In marked contrast to this is the incidence at the Long Island College Hospital where only four patients were admitted to a fairly active service in thirty-six years, from 1914 to 1950. At the Norwegian Hospital only one case of abdominal pregnancy has ever been recorded.

TABLE I
INCIDENCE OF ABDOMINAL PREGNANCIES
LONG ISLAND COLLEGE DIVISION, KINGS COUNTY HOSPITAL

Obstetric admissions	22,242
Gynecologic admissions	17,632
Total	39,874
Extrauterine pregnancies	248 or 1 to 161
Abdominal pregnancies	6 or 1 to 6,646 (or 1 to 41 extrauterine)

TABLE II
AGE INCIDENCE

Age Group	New Orleans Charity Hosp.	Medical College of Va.	L.I. College—Kings County Hosp.
15–19	1	0	1
20–24	2	3	1
25–29	6	3	1
30–34	6	5	6
35–39	5	1	2
40 plus	0	1	0

In Tables II, III and IV I have compared the age, gravidity and color incidence in this series with the series of abdominal pregnancies reported from the New Orleans Charity Hospital by Beacham and Beacham and the series of late extrauterine pregnancies reported by Ware from the Medical College of Virginia. It will

* Read at the meeting of the New York Obstetrical Society, May, 1950.

be noted that the greatest incidence is in the age groups over twenty-five years. A similar age incidence has been observed in most of the large series of tubal gestations reported. The youngest patient in our series was nineteen, the oldest thirty-eight. The highest incidence

TABLE III
GRAVIDITY

Gravida	New Orleans Charity Hosp.	Medical College of Va.	L.I. College—Kings County Hosp.	Total
1	8	2	3	13
2	6	4	4	14
3	1	5	1	7
4	2	2	2	6
5	0	0	1	1
6	3	0	0	3

is found in primigravidas or those patients who have had relatively few previous pregnancies.

TABLE IV
INFLUENCE OF COLOR

		No. of Cases	White	Colored	Admission Ratio (White: Colored)
L. I. College—Kings County Hosp.	1939–1950	6	0	6	
L. I. College Hosp.	1914–1950	4	3	1	1:1
Norwegian Hosp.		1	1	0	
	Total..	11	4	7	
New Orleans Charity Hosp.	1937–1945	20	1	19	1:3
Medical College of Va.	1930–1946	13	0	13	1:1

All six of the patients in our series from the Kings County Hospital were Negresses despite the fact that approximately equal numbers of white and colored patients were admitted during this eleven-year period. One of the four patients observed at the Long Island College Hospital was a Negress. Seven of our eleven cases occurred in members of the Negro race.

In the Beacham series nineteen of the twenty patients were colored although the admission ratio at the New Orleans Charity Hospital was barely three colored patients to one white. All of the thirteen patients reported on by Ware were colored despite the fact that the admissions were about equally divided. Douglass and Kohn in reporting abdominal pregnancies occurring in the city of Baltimore found the incidence sixteen times greater in Negresses than in white patients.

Four of the patients in this series gave a history of previous pelvic inflammatory disease. Three had previous laparotomies. One of these was an appendectomy prior to the patient's last pregnancy. The other two laparotomies were for ectopic gestations. One of these patients had no pregnancies for nine years following her first ectopic pregnancy and then had an abdominal pregnancy. The history of the second patient who had a previous ectopic pregnancy is interesting. During the first year of her marriage she had two induced abortions followed with a five-year period of infertility. She then had a tubal gestation and this in turn was followed with an abdominal pregnancy after six years of infertility. This patient was operated upon near term and now has a living child.

Three of the cases occurred in primigravidas, six in patients who had delivered at term one or more times, and three in patients who had had one or more abortions previously. In two cases the last pregnancy had been an ectopic pregnancy and in another two an abortion.

In nine of our cases a prolonged period of infertility preceded the abdominal pregnancy. Some authors of recent reports of large series of tubal gestations have not found this factor present. One patient was a primigravida married nine years. In these cases the years since last pregnancy were three, five and a half, six, seven, eight, eight and a half, and ten, respectively.

There was no patient in our series who had bleeding without pain as an early symptom. Three patients had pain but no bleeding and seven had pain with bleeding. Pain was an early symptom in ten of our eleven cases. Pain with or without bleeding is the most common symptom of tubal abortion or rupture. In ten of our eleven cases the early symptomatology was compatible with a diagnosis of tubal abortion or rupture.

In the Beacham series fifteen of twenty cases (75 per cent) had such a history and in Ware's series ten of the thirteen (77 per cent) did. Such a history can be elicited in nearly all cases of abdominal pregnancy.

Five of the patients were hospitalized in the

early weeks principally because of pain. In one case the pain was so severe that a diagnosis of renal colic was entertained and then ruled out by intravenous pyelography. Laparotomy was refused by this patient after a diagnosis of tubal pregnancy was made. A second patient refused operation after that diagnosis was made. A tentative diagnosis of ectopic pregnancy was made in a third case but this diagnosis was subsequently changed to intrauterine pregnancy and the patient was referred to the obstetric clinic. One patient was admitted to the medical service of a hospital complaining of abdominal pain, vomiting and faintness. She was thought to have a gastrointestinal upset complicating pregnancy and no gynecologic opinion was obtained. One patient was improperly diagnosed as having pelvic inflammatory disease. All five patients were discharged without undergoing surgery.

One patient who had pain associated with considerable bleeding was treated at home by a physician whose diagnosis was inevitable abortion. The patient was packed on two occasions; she continued to have pain throughout most of her pregnancy. A diagnosis of abdominal pregnancy was made when she was hospitalized several weeks before term. At laparotomy a living child was found free in the abdominal cavity.

Four patients who had pain sought no medical attention. Two of them stayed in bed for a period of several weeks. Two patients had severe pain and two had mild pain.

Late Symptoms. In the advanced cases the patients frequently complain that fetal movements are painful, that they are not carrying right or that the baby is too high. (Table v.)

Nausea, vomiting, abdominal pain, spotting, constipation, dysuria, weakness and loss of weight are other common symptoms. If fetal death and infection have taken place, the patient may complain of such symptoms as malaise, fever, chills or chilly sensations. Patients near term may have false labor pains and bloody show. This is usually followed in several days with cessation of fetal movements.

In two of our patients upon whom laparotomy was performed near term no sac was found, there being only a few shreds of membrane about the cord. The two babies were alive and lying free in the abdominal cavity. These two patients complained bitterly of painful fetal movements, had marked gastrointestinal symptoms and loss of weight and strength. The two patients who experienced false labor pains were near term.

The findings on abdominal examination are as follows: (1) abdominal tenderness and distention; these may preclude satisfactory palpation but the mere presence of these findings should suggest abdominal pregnancy; (2) transverse or oblique presentations with the fetus often unusually high in the abdomen; (3) fetal parts or movements palpated very superficially and an unusually loud fetal heart; (4) an area of tympany in the midline extending below the umbilicus; (5) the presence of a second mass in the lower abdomen; (6) failure to feel Braxton Hicks contractions and round ligaments on palpation of the larger tumor mass; (7) abnormal pulsations or a souffle audible at an unusual site; (8) excessive mobility of the fetus if the sac is ruptured.

TABLE V
LATE SYMPTOMS

Gastrointestinal	3
Spotting	3
Dysuria	1
Abdominal pain	7
Painful fetal movements	2
False labor pains with bloody show	2
Weakness and loss of weight	2

In six of our cases abdominal tenderness was present and three patients had considerable abdominal distention. In one case this was so marked that laparotomy was deferred for several days until the distention was relieved. One patient had a fluid wave and dullness in the flanks. In four cases the presentation was oblique or transverse. The uterus was palpated as a separate mass in six of our cases and the fetus was palpated very superficially in three cases.

The characteristic pelvic findings are as follows: (1) a cervix that is lacking in effacement, that is less softened than is usual for advanced pregnancy and is displaced; this displacement may be in the direction of the introitus or forward and upward behind the symphysis and off to one side; it is usually undilated and tender on motion (Table vi); (2) the uterus is usually felt separately and even at term is usually not larger than the size of a three to four months' gestation. It is softened, often displaced and may be compressed; if the cervix is sufficiently dilated to permit digital exploration, a small, empty uterine cavity is found;

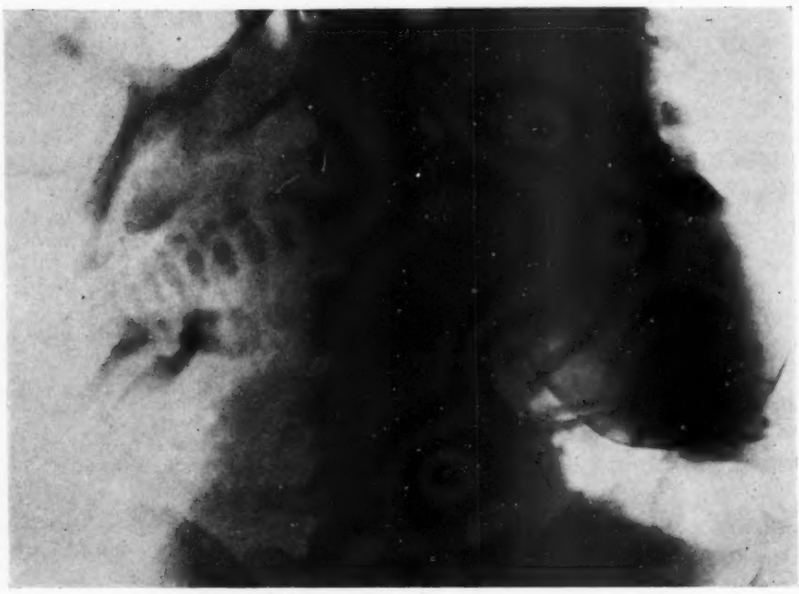

FIG. 1. Abdominal pregnancy near term.

(3) the fetal head or breech may be palpated superficially in the cul de sac or in the fornices; at times the placenta may be felt as a cystic mass.

The two cases in which some cervical dilatation was noted were near term and the patients had complained of false labor pains. Great care must be taken in making a pelvic examination to avoid rupture of the sac and separation of the placenta. The examination should not be made with the patient under anesthesia.

TABLE VI
CONDITION OF CERVIX

No effacement	11
Somewhat softened	11
Displaced	8
Tenderness	3
External os closed	9
External os 1 cm	1
External os 2 cm	1

Roentgenographic examination of the abdomen using soft tissue technic may be of great value in confirming the diagnosis of abdominal pregnancy and is a safe procedure. (Fig. 1.) It may disclose that the fetus is not enclosed by a uterine shadow, that the child is in a transverse or oblique presentation and is unusually high in the abdomen. A transverse presentation that is unusually low is also diagnostic. The small uterus and placenta may often be visualized. The presence of a gas-filled viscus very close to a part of the fetus is suggestive as is the sprawled-out grotesque attitude of the fetus.

In our series this type of examination was employed in six cases. In two cases it confirmed the diagnosis of abdominal pregnancy and in two others it was suggestive. The remaining two cases were diagnosed as intrauterine gestations by the roentgenologist. Some of our roentgenograms were not as good as they should have been.

Hysterography and hysterosalpingography have been employed by a number of authors. I have had no personal experience with this diagnostic aid but can readily appreciate its value. I hesitate to use this method because of the danger of inducing premature labor or abortion if the pregnancy should prove to be intrauterine. Greenhill advocates this procedure when the fetus is dead. My belief is that the possibility that the dead fetus might be intrauterine contraindicates the introduction of anything into the uterus because the danger of infection is too great. The physician who entertains the possibility of abdominal pregnancy will seldom fail to make the diagnosis.

TECHNIC OF OPERATION

All authors agree that laparotomy should be performed as soon as the diagnosis of abdominal pregnancy is made except in rare instances. In cooperative hospitalized patients in good condition it may be justifiable to observe the

patient and delay the operation for a short time in behalf of a fetus that will soon become viable.

Prior to laparotomy the patient should be cross matched for transfusion and four or five units of compatible blood taken to the operating room with the patient even though she is in excellent condition. A saline infusion should be started before the operation is begun in all instances, using a transfusion set. If hemorrhage or shock occurs, the patient can be transfused without delay.

It cannot be emphasized too strongly that at the time of laparotomy the sac and placenta should be disturbed as little as possible until a decision has been made as to the type of placental management to be employed. In most cases it is inadvisable to attempt to visualize the sources of placental blood supply until after the sac has been incised and the fetus removed.

The sac should be incised in an avascular area and the child extracted with extreme gentleness. The placental attachments should then be studied, avoiding any undue traction on the cord and sac which might cause separation of these attachments and hemorrhage. No attempt should be made to remove the placenta unless the blood vessels supplying it are accessible for preliminary ligation. When the placenta is left *in situ*, the abdomen should be closed without drainage in the absence of hemorrhage or frank infection. Degeneration of the placenta with liquefaction may be mistaken for infection.

Marsupialization, drains and packs cause increased morbidity and mortality and their use should be avoided whenever possible.

Rarely does the placenta that is left have to be removed because of secondary hemorrhage. Occasionally drainage has to be instituted because of subsequent infection, particularly in the cases in which the placenta was attached to bowel. Chemotherapy and the use of antibiotics may obviate this to a large extent. A placenta that is left will ultimately be absorbed in most cases.

The available statistics from the literature make it appear that the mortality rate for this procedure is almost twice that of complete removal of the placenta. Possibly some revision of these statistics can be made. The first step would be to separate the cases in which the placenta was left *in situ* and the abdomen was closed without drainage from those in which it was left but was marsupialized, drained or packed against. It is my impression that when a sufficient number of recent cases in which the placenta was left without any form of drainage are available for study the mortality rate will not be much higher than when the placenta was removed. Mason found twelve cases in the literature in which no attempt was made to remove the placenta and the abdomen was closed without drainage. All of these patients survived whereas in ten cases in which the placenta was not disturbed but was marsupialized, packed against or drained only five lived.

TABLE VII
MANAGEMENT OF PLACENTA

Months	Removed	Left without Drainage	Partially Removed	Marsupialized
4–5	0	0	2	1
5–6	1	0	0	0
6–7	1	0	0	0
7–8	2	0	0	0
9–10	1	2	0	1
Total	5	2	2	2

The maternal mortality rate in advanced extrauterine pregnancy has been so high in the past that conservation of pelvic organs has warranted little consideration in the management of this condition. Possibly in childless young women if the placenta cannot be removed safely unless hysterectomy is done no attempt should be made to remove the placenta and the abdomen should be closed without drainage. (Table VII.)

In two of the late cases in our series the placenta was left *in situ* and the abdomen closed without drainage. These two patients had completely uneventful postoperative recoveries which were practically afebrile. One of these patients had a laparotomy for acute appendicitis two and a half years later, at which time no trace of the placenta was found. A hysterectomy for uterine fibromyomas was performed upon the second patient eight years after the placenta was left *in situ*. The right ovary was found to be adherent to the site where the placenta had been implanted. In freeing the ovary several very small fragments of calcified placental tissue were found and removed.

The placenta was marsupialized in two of our cases because profuse bleeding occurred during visualization of the placental attachments. Probably this could have been avoided by more cautious exploration and the abdomens closed without drainage. In ten of the eleven cases the placenta was thought to be actively functioning at the time of laparotomy.

TABLE VIII
MATERNAL AND INFANT MORTALITY

Months	No. of Cases	Maternal Deaths	Stillbirths	Neonatal Deaths
4–5	3	0	3	0
5–6	1	0	1	0
6–7	1	0	1	0
7–8	2	0	2	0
9–10	4	0	1	1
Total	11	0	8	1

There were no maternal deaths in this series. Seven of the patients were discharged in good condition before the twentieth postoperative day. (Table VIII.)

Three of the infants were born alive but one died neonatally. The baby in a fourth late case died while the patient was under observation in the hospital. A tentative diagnosis of abdominal pregnancy had been made and while awaiting roentgenographic confirmation false labor ensued. The fetal heart which had been good was no longer heard when listened for just prior to laparotomy. The baby was not macerated and apparently fetal death occurred soon after the onset of false labor.

One of the babies that lived was normal in every respect and now has children of her own. The other child is now fifteen years of age and in good health. A calcaneous deformity present at birth has been corrected.

CONCLUSIONS

1. Abdominal pregnancy is a most interesting condition, but its incidence can and should be reduced. The public must be taught that pain is not a normal symptom of early pregnancy. The physician must learn to recognize better the symptoms of tubal pregnancy.

2. Most patients with late cases of extrauterine pregnancy should have been operated upon in the early weeks when salpingectomy would have sufficed.

3. In a suspected case of abdominal pregnancy great care should be taken in making a vaginal examination to avoid rupture of the sac or separation of the placenta. The examination should not be made under anesthesia.

4. Operation should seldom be deferred when the diagnosis of abdominal pregnancy is made. Postponement of the laparotomy is justifiable in the interest of the child under the following conditions: the patient is under careful observation in a hospital, the patient is in excellent condition, if the child will shortly become viable, and if false labor does not ensue.

5. Laparotomy should not be undertaken unless large amounts of compatible blood are available in the operating room. When immediate operation must be done because the patient is in shock, the blood should be obtained as quickly as possible.

6. When the abdomen is opened, the first step should be incision of the sac and very gentle removal of the fetus. The second step should be visualization of the sources of placental blood supply provided this can be done without exerting undue traction on the sac or cord.

7. The maternal mortality rates in the literature make it appear that removal of the placenta has given the best results. Possibly some further study and breakdown of these statistics will result in a somewhat different conclusion.

8. As our experience has increased, it has become apparent that the placenta should be left *in situ* and the abdomen closed without drainage more often than has been done in the past. This type of management is favored under the following circumstances: absence of bleeding and infection, the sources of placental blood supply are inaccessible or appear too formidable for preliminary ligation, at times to avoid hysterectomy in childless young women, and the operator is inexperienced.

9. A placenta that is left will ultimately be absorbed in most cases. Occasionally a placenta that is implanted on bowel will become infected and require drainage. Rarely will a placenta have to be removed because of secondary hemorrhage.

10. Drains, packs and marsupialization should not be used except for the control of unavoidable hemorrhage or in the presence of frank infection.

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CARCINOID TUMORS OF THE GASTROINTESTINAL TRACT*

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A CONSIDERABLE body of literature relative to carcinoid tumors has accumulated since Lubarsch[1] in 1888 distinguished these growths from other varieties of neoplasms affecting the gastrointestinal tract. Oberndorfer[2] in 1909 designated these tumors "carcinoids" in the belief that they were actually benign lesions with histologic resemblances to carcinomas. Despite the efforts of Masson[3] to introduce a more descriptive terminology, argentaffinomas in deference to their affinity for the silver stains, and the suggestion of Dickson, Parkhill and Kiernan[4] that they be regarded as Grade 1 carcinomas, particularly when they involve the small intestine, the term "carcinoids" has been generally accepted.

Carcinoid tumors are relatively uncommon. Ritchie and Stafford[5] in 1944 collected 332 cases exclusive of those of appendiceal origin. Dockerty and Ashburn[6] estimated on the basis of an analysis of the material at the Mayo Clinic that carcinoid tumors of the ileum accounted for 23 per cent of all malignant neoplasms affecting the small bowel. Malignant tumors of the small intestine constitute only 0.5 per cent of all malignant neoplasms of the gastrointestinal tract. The statistics of Raiford[7] and Botsford and Seibel[8] confirm these observations.

These tumors, as demonstrated by Masson, originate in the chromargentaffin cells situated in the crypts of Lieberkühn. The segmental distribution of carcinoid tumors along the gastrointestinal tract varies in proportion to the number of these particular cells found in a given area. They occur most frequently in the appendix and then appear with decreasing frequency in the terminal ileum, jejunum, rectum, colon, cecum, stomach, gallbladder and duodenum. Lemmer[9] in 1942 reviewed ten cases affecting the stomach. Stout[10] found that in twenty-six cases involving the large intestine twelve occurred in the rectum, ten in the colon and four in the cecum. Bretano,[11] quoted by Christopher, and Brunschwig and Childs,[12] reported separate cases arising in the ampulla of Vater. Bosse[13] recorded the third case to be found in the gallbladder while Blackwell and Dockerty[14] described the fourth example of a carcinoid tumor in a dermoid cyst of the ovary.

A search of the files of the Lahey Clinic reveal that thirty-one carcinoid tumors have been observed in the period from 1931 to January, 1948. These neoplasms affected the various segments of the gastrointestinal tract in the following order of frequency: stomach one, colon one, ampulla of Vater one, ileum twelve and appendix sixteen. Thus 50 per cent of these tumors occurred in the appendix and 89 per cent were confined to the region of the appendix and ileum.

Pathology. Masson has localized the origin of these tumors to proliferation of the Kultschitzky cell situated in the crypts of Lieberkühn. Dockerty and Ashburn in their analysis of carcinoid tumors of the ileum substantiate this theory. The specific physiologic function of these cells has not been precisely determined although Best and Taylor[15] related that various investigators have imputed an endocrine or enzymatic activity to them.

Grossly these tumors occur as solitary nodules in the appendix but are frequently multiple when they are located in the ileum. It is largely agreed that these are multiple primary growths rather than metastatic manifestations. The primary tumor is usually small and not infrequently the metastatic lesions attain greater size than the original neoplasm.

These tumors, which are yellow or light orange in color, may occur at any point on the circumference of the bowel but are frequently antimesenteric in location. They are essentially submucosal in origin; but as they spread by centrifugal expansion, they invade the muscularis and mucosa and ultimately break

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through the serosa. They ulcerate more slowly than other varieties of gastrointestinal neoplasms and encroach on the lumen of the bowel secondarily. These particular features account for the infrequency of hemorrhage and the insidiousness of obstructive manifestations associated with these tumors.

Carcinoid tumors spread by direct extension through the submucosa, muscularis and serosa and by way of lymphatic channels and perineural spaces to regional lymph nodes. As the multiple lesions of the terminal ileum extend through the serosa and spread to involve conglomerate lymph nodes, loops of intestine become matted together and kinked, thereby producing obstructive symptoms.

Tumor-spread by blood vessel invasion was particularly evident in the case reported by Ritchie and Stafford, showing metastasis to the spleen, uterus and both ovaries with microscopic clusters of cells within vascular lumens. Liver metastases, which are generally indicative of spread by blood vessel involvement, occur with relative frequency in the presence of carcinoids of the small intestine.

Dockerty and Ashburn insisted that all carcinoid neoplasms are indeed malignant and that it is well to designate them as Grade 1 adenocarcinomas (carcinoids) to suggest at once that they are universally malignant and of specific cell origin.

Carcinoid tumors are composed of small cuboidal cells with small, deeply staining nuclei. The cells grow in groups and invade lymphatic channels and stream along nerve sheaths. They contain granules which have an affinity for certain silver stains. Mitoses are rarely seen.

Clinical Features. In the thirty-one cases observed at the clinic the youngest patient was twenty years of age and the oldest sixty-nine; the average age was 46.3 years. There were ten males (32 per cent) and twenty-one females (68 per cent). Six of the tumors involving the ileum, twelve in the appendix and one in the colon were incidental findings at autopsy or were removed incidentally in a surgical specimen resected for another variety of primary lesion. In the twelve remaining cases the lesion was provocative of symptoms. These lesions were distributed as follows: one in the stomach, one in the ampulla of Vater, four in the appendix and six in the ileum.

It should be remarked that of the nineteen instances of asymptomatic carcinoid tumors studied ten were associated with other malignant neoplasms. The associated diseases in the remaining nine cases included cholecystic disease in four instances, fibroid uterus in three cases, adrenal tuberculosis in one case and retroverted uterus in one case.

CARCINOIDS OF STOMACH

CASE 1. A forty-three year old male was first seen in the clinic October 8, 1945, complaining of constipation and melena. The first episode of bleeding had occurred two and a half years prior to his first visit to the clinic and was severe enough to warrant three transfusions. Two months before his current admission he had another massive hemorrhage. The patient had had mild, periodic epigastric burning for four years. Physical examination was negative except for obvious anemia.

The hemoglobin was 62 per cent and the hematocrit reading 30 per cent. Roentgenograms following a barium meal showed mucosal distortion high on the lesser curvature. On October 7, 1945, a subtotal gastric resection was performed. The pathologic specimen revealed a firm tumor on the anterior wall of the stomach near the lesser curvature. The mucosal surface was not ulcerated at the time of resection. Microscopic examination showed a typical carcinoid tumor with metastases to one of three lesser curvature lymph nodes.

The patient was living and well and free of gastrointestinal symptoms two and a half years after the operation.

Comments. Carcinoid tumors of the stomach are rare. Lemmer in 1942 analyzed nine cases from the literature and reported one of his own. His patient suffered from repeated massive hemorrhages but at operation it was found that the bleeding derived from a separate ulcer lying opposite the carcinoid neoplasm. Subtotal gastrectomy relieved the patient's symptoms.

One other patient in the series with carcinoid tumor had massive hemorrhage relieved by partial gastrectomy. Metastases to regional nodes and to the liver were observed in another instance. Six of the tumors involving the stomach were incidental autopsy findings.

It will be observed that in three of eleven cases of carcinoid neoplasm of the stomach massive hemorrhage was the predominant symptom. Metastases were present in two instances. The prognosis in our case must be

speculative in view of the nodal metastases but the patient was living and well two and a half years following resection.

AMPULLA OF VATER

CASE II. A forty-six year old male was seen at the clinic September 23, 1942, with a history of indigestion of five years' duration. He became jaundiced three months prior to his appearance at the clinic. The jaundice, which was painless, had varied in intensity. The patient was moderately jaundiced at the time of his initial examination at the clinic. The distended gallbladder was palpable in the right upper quadrant. The abdomen was explored on September 28, 1943, at which time a tumor was palpable in the region of the ampulla of Vater. A cholecystojejunostomy was performed. The jaundice subsided and on October 26, 1943, pancreatoduodenectomy was performed. The postoperative course was without incident. The specimen showed a carcinoid tumor of the ampulla of Vater with four negative lymph nodes. A small probe could be passed through the center of the tumor into the common duct.

The patient did well following discharge from the hospital but had some diarrhea which was not completely controlled by the administration of pancreatin. In October, 1947, four years following resection, the patient experienced some pain in the right costal margin. Roentgen studies showed a destructive process in the sixth and ninth ribs on the right side. The patient's general condition gradually deteriorated and he died on May 31, 1948, four years, eight months after resection.

Comments. Christopher related that Bretano[11] removed successfully a carcinoid tumor of the ampulla of Vater in a forty-five year old man. The patient was alive and well three years after operation. Brunschwig and Childs reported a case of a tumor involving the ampulla of Vater in which the microscopic pattern was highly suggestive of a carcinoid neoplasm but no argentaffin granules could be demonstrated by special stains. The patient showed no evidence of recurrence fifteen months following resection. Preoperatively this patient had steatorrhea indicative of pancreatic duct obstruction but no jaundice.

The clinical manifestations of the ampullary tumor in the case observed at the clinic were not different from those observed with other varieties of carcinoma involving the ampulla of Vater. The lesion obstructed the common duct producing jaundice of varying intensity which, contrary to repetitious comment in the literature, is a common characteristic of the jaundice in neoplasms of the ampulla of Vater. This tumor may have been present for several years before its discovery judging by the prolonged history of dyspepsia. The bony metastases indicate a hematogenous spread.

ILEUM

The first case is reported in some detail since it is typical in many respects of the clinical course of patients with these lesions when they occur in the ileum. The other five symptomatic cases are reported in brief outline.

CASE III. A woman sixty-two years of age was seen at the clinic on October 9, 1946, relating a history of recurrent attacks of colicky, generalized abdominal pain, nausea and distention occurring at irregular intervals for the past three years. The attacks had been more frequent in recent months, requiring morphine for relief. The last episode had persisted for three weeks. The patient had been constipated for sixteen years and had depended upon a daily laxative for elimination. She had had an appendectomy in 1919, a uterine tumor removed in 1921 and a cholecystectomy in 1930.

The patient was well nourished. The abdomen was slightly distended and tenderness was elicited in the right lower quadrant. There was a small mass in the region of the cecum.

Serial films following a barium meal showed some irregular dilatation of the terminal ileum. Examination after a barium enema was negative. Conservative measures were unavailing and operation was resorted to on April 18, 1947. At laparotomy numerous coils of dilated terminal ileum were densely matted together. An enteroenterostomy was performed, diverting the intestinal contents around the involved portion of terminal ileum. This maneuver relieved the obstruction but the patient continued to have colicky pain and consequently the involved segment of intestine was resected on October 20, 1947. The intestinal continuity was restored by end-to-end anastomosis of the small bowel. The postoperative course was uneventful.

The specimen consisted of an adherent loop of small bowel measuring 100 cm. in length. In the middle of one dilated loop was an irregular ulcer measuring 0.8 cm. in diameter. The

edges were elevated and indurated. Nearby there was a similar firm, circumscribed nonulcerated tumor. Microscopic analysis showed that each separate tumor was a carcinoid, one of which was actively invading the muscularis and lymphatic channels. No nodal metastases were observed.

CASE IV. A woman fifty-nine years of age complained of watery diarrhea of eight months' duration. There had been an associated weight loss of 16 pounds. Abdominal examination was negative but nodules could be felt in the cul-de-sac on bimanual examination. Roentgenograms after a barium meal showed that the stomach was displaced toward the right. At abdominal exploration the parietal and visceral peritoneum was studded with small tumor nodules. Loops of terminal ileum were matted together. An enteroenterostomy was performed. Biopsy specimen revealed metastatic carcinoid tumor. The patient died five months following the operation.

CASE V. A woman thirty-eight years of age complained of fatigue, flatulence and epigastric fullness of one year's duration. There was a firm fixed mass in the right lower quadrant. The liver was enlarged and nodular. Exploration of the abdomen revealed massive retroperitoneal and liver metastases apparently arising from a small tumor in the ileum. The patient died on the fifth postoperative day. At autopsy a tumor measuring 1 by 3 cm. was present in the terminal ileum, with diffuse metastases to the mesenteric and retroperitoneal nodes and to the liver. Microscopic diagnosis was carcinoid tumor of the ileum.

CASE VI. A woman fifty-four years of age had a cholecystectomy in 1938. At that time the liver contained metastatic nodules which microscopically were typical of a carcinoid tumor. The patient subsequently had progressive recurrent attacks of abdominal pain, nausea and vomiting. She noticed a firm mass in the right lower quadrant. There was a large, fixed, palpable tumor to the right of the umbilicus. At abdominal exploration in May, 1941, the liver, omentum and mesentery were studded with tumor masses. The terminal ileum was dilated and thickened and contained a tumor mass at the point of partial obstruction. Biopsy of the ileal tumor and of the metastatic nodules revealed carcinoid tumor. An ileotransverse colostomy was performed. The patient died in October, 1946, five years after the palliative operation and eight years following the demonstration of carcinoid tumor metastases in the liver.

CASE VII. A woman fifty-seven years of age complained of abdominal pain, watery diarrhea, flatulence and weakness. The patient was pale and malnourished. The abdomen was slightly distended and tender. Serial films of the small intestine following a barium meal showed dilated loops of terminal ileum. At operation in December, 1943, 4 feet of chronically intussusçepted terminal ileum were resected. There was a firm tumor 2.5 cm. in diameter near the center of the removed segment of intestine and a similar tumor in the adjacent mesentery. Microscopic section revealed carcinoid tumor with metastasis to one of four lymph nodes. The patient was alive and well four years after operation.

CASE VIII. A woman sixty-five years of age complained of intermittent attacks of colicky pain of twenty years' duration. During the week before examination at the clinic the attacks occurred frequently and were particularly severe. The abdomen was moderately distended. No abdominal masses were palpable. Roentgenograms of the small bowel showed partial obstruction of the terminal ileum. At operation in January, 1948, two small tumors were palpable in the terminal ileum. In the adjacent mesentery there were several large, conglomerate lymph nodes. The involved bowel and mesentery were resected. Microscopic analysis showed two primary carcinoid tumors of the ileum with spread to the regional lymph nodes. The patient has been symptom-free since the operation and has gained 6 pounds in weight.

Comments. Carcinoid tumors of the ileum constitute the most significant localization of this particular type of gastrointestinal malignancy. They occur essentially in the sixth decade of life, grow slowly, produce symptoms and metastasize. They cause low grade, progressive, small bowel obstruction. They tend to remain relatively small and to be multicentric and rarely ulcerate sufficiently to cause hemorrhage. As these tumors invade the muscularis, they cause kinking of the intestine and matting together of the loops of terminal ileum. Radical resection with wide removal of adjacent mesentery is essential to the effective surgical treatment of this lesion. Despite metastatic tendency the patients may survive

for many years with irremovable masses of distant spread.

It is obvious that all carcinoid tumors of the small intestine are malignant and that early surgical excision is desirable before metastatic seedings occur.

COLON

CASE IX. A man thirty-five years of age had a resection of the hepatic flexure in October, 1944, for adenocarcinoma. In June, 1945, the patient was operated upon for recurrence of the tumor. In the specimen removed there was a small carcinoid tumor of the transverse colon near the recurrent adenocarcinoma. The metastatic nodules in the liver resembled the primary adenocarcinoma rather than the carcinoid.

Comments. Carcinoid tumors of the large bowel are exceedingly rare. Stout collected twenty-six cases from the literature and added six of his own.

APPENDIX

There were sixteen patients with carcinoid tumors of the appendix. In twelve instances there were no localizing signs or symptoms of the disease and the tumors were incidental operative or autopsy findings. In the four remaining cases briefly abstracted hereafter there were associated vague symptoms which might have been due to the presence of the carcinoid tumors.

CASE X. A woman twenty years of age complained of indefinite right lower abdominal pain of five weeks' duration. Nausea, flatulence and urinary frequency were associated with the pain. Moderate tenderness was present over McBurney's point. The leukocytes numbered 8,900. The appendix, removed at operation October 19, 1934, appeared grossly normal but pathologic analysis showed a small carcinoid tumor.

CASE XI. A woman thirty-six years of age had lower abdominal pain with occasional acute exacerbations for the past fourteen months. Nausea and vomiting rarely occurred. There was moderate tenderness in the right lower quadrant. The leukocyte count was normal. At operation a hydrosalpinx was found. The appendix was inflamed and when sectioned a tumor 0.8 cm. in diameter was discovered near the tip of the organ. Microscopically the tumor proved to be a carcinoid neoplasm.

CASE XII. A woman thirty-six years of age complained of intermittent dull aching pain in the right lower quadrant of the abdomen for two years. Prior to the initial clinic visit the patient had had an attack of sharp pain in this area. There was slight tenderness in McBurney's area to deep palpation. The appendix was removed on February 24, 1938, and the pathologic report revealed acute recurrent appendicitis and a carcinoid tumor. The patient was free of recurrence five years later.

CASE XIII. A woman thirty-seven years of age had intermittent dull pain in the right lower segment of the abdomen for one year. There was some tenderness in the right adnexal region as determined by bimanual examination. At operation on November 29, 1944, a tumor of the appendix was found. The histologic picture was characteristic of a carcinoid tumor.

Comments. In sixteen cases of carcinoid neoplasm involving the appendix there was no instance of obvious spread of the tumor beyond the appendix. This finding is consistent with the observation of Wells and Joffe[16] that carcinoid tumors of the appendix are not prone to contiguous extension or to metastases. These authors could find but twenty instances in the literature of metastasizing carcinoid tumors arising in the appendix. Raiford, on the other hand, reported an incidence of malignant change in carcinoid of the appendix as 5.9 per cent. D'Ingianni[17] reported twenty-nine cases of carcinoid tumors of the appendix in which ten of the tumors involved the serosa, but in only three instances (10 per cent) was there metastatic involvement of the adjacent lymph nodes. On the basis of cumulative data in the literature substantiated by an analysis of our own material it is reasonable to conclude that carcinoid tumors of the appendix are less malignant and less productive of clinical symptoms than are similar tumors located in the stomach or small intestine.

CONCLUSIONS

The diverse localization and varied clinical expression of carcinoid tumors of the gastrointestinal tract are discussed. The malignant characteristics of these neoplasms are emphasized.

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THE FATE OF FROZEN HOMOGENOUS BONE TRANSPLANTS*

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THE necessity of additional bone for certain orthopedic procedures in order to reduce morbidity and complicating factors from secondary operations has stimulated the use of frozen homogenous bone. There have been a few isolated reports regarding the transplantation of bone as early as the nineteenth century. It was in 1867 that Ollier[1] published his "Treatise" in which he observed that temperatures above 16°C. increased the rate of putrefaction. Below this temperature the rate was delayed and by freezing bone he was able to transplant it successfully into another animal.

Macewen[2] in 1878 was the first to report the use of homogenous bone to rebuild the humerus. Calve[3] reported fifteen cases of ground cancellous beef bone stored in ether. Smith,[4] in his report on successful homogenous bone transplants, reported two instances in which grafts had been refrigerated and autoclaved before use. Inclan[5] in 1942 reported a series of cases in which stored bone was used for grafting. He stored the grafts in citrated blood from the donor in saline and blood at temperatures of 2 to 5°C. for periods up to sixty-one days. Bush and Garber[6] in 1945 found that bone could be preserved for indefinite periods of time at −24°C.

The fate of bone transplants has been carefully studied by Barth,[7] Auxhausen,[8] Phemister,[9] Brooks and Hudson,[10] and Ghormley.[11] They have pointed out that when bone transplantation has been completed, there is about the wall of the graft a wall of blood clot which begins the usual stages of organization. The haemopoetic cells of the bone marrow undergo necrosis and absorption. The medullary canal then becomes filled with callus. The vessels of the haversian systems undergo necrosis except in spongy portions or periphery which may remain alive and take part in the regenerative process. The bone cells undergo necrosis and absorption. There is gradually an invasion of the transplant by granulation tissue and the haversian canals are restored by an ingrowth of vessels from the periphery. The invasion is delayed somewhat in the case of cortical transplants because of their relative impermeability. During this period the transplant may undergo death of varying degrees of completeness. New bone is formed by metaplasia of the pre-existing connective tissue in the region in which the bone is laid down. Ultimately the transplants become restored to normal consistency.

The purpose of this experimentation was to determine the fate of frozen homogenous bone transplants in dogs.

METHODS OF STUDY

This study was carried out on dogs. Cortical grafts measuring 6 to 10 cm. were transplanted into the radius of dogs. The grafts were stored in a deep freeze at −15° to −25°C. until time of transplantation. Sections were taken from the areas of regeneration at intervals ranging from one to 170 days. All sections were examined microscopically in the decalcified state.

RESULTS

In the region of the transplant as the wound is healing a hematoma is formed. As the hematoma becomes organized, osteoblasts and their precursors proliferate from the periosteal and endosteal side of the host to form a firm callus which surrounds the transplant. (Fig. 1.) The endosteum and periosteal side of the transplant have very little osteogenic potential.

The haversian systems during the first ten to fourteen days undergo a marked dilatation and necrosis. In autogenous transplants about 25 per cent of the lacunar spaces were filled with osteocytes especially near the endosteal and periosteal surface of the graft. The lacunar

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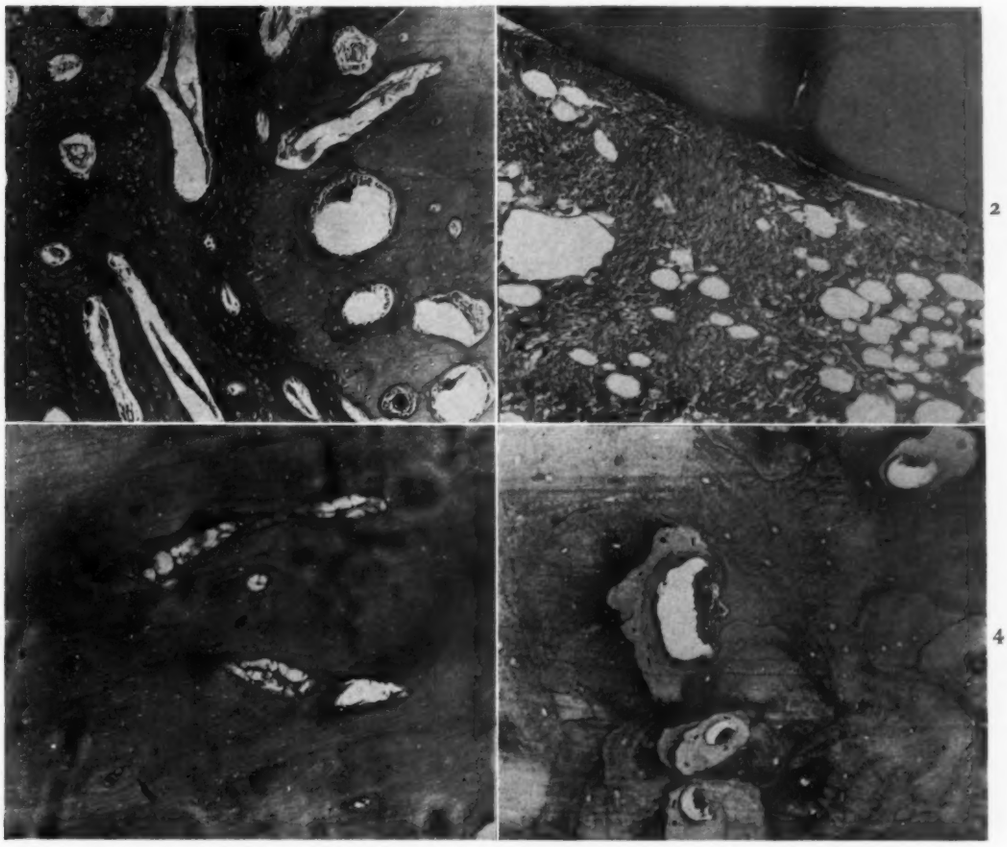

FIG. 1. Frozen homogenous transplant fifteen days after transplantation; there is a firm callus between the host and transplant. PAS stain, × 100.
FIG. 2. Frozen homogenous transplant eight days after transplantation; the lacunar spaces are empty and have no osteogenic potential. Hematoxylin and eosin stain, × 100.
FIG. 3. Frozen homogenous transplant twenty-four days after transplantation; cellular elements fill the haversian systems. Hematoxylin and eosin stain, × 100.
FIG. 4. Frozen homogenous transplant sixty-four days after transplantation; the osteoblasts pervade the transplant to form new bone. Alkaline phosphatase stain, × 100.

spaces in frozen homogenous grafts were completely empty and there was no osteogenic potential within the graft. (Fig. 2.) The haversian systems become filled with cellular elements which are destined to become osteoblasts. (Fig. 3.)

There was a gradual replacement of the transplants by active osteoblasts which were associated with the formation of new bone in other regions. The osteoblasts seem to pervade the transplant, secreting a substance associated with the dissolution of bone. (Fig. 4.) In frozen homogenous transplants there is a connective change before it is invaded by osteoblasts. (Fig. 5.) This retards the creeping substitution about 50 per cent.

There is restoration of normal consistency in both autogenous and frozen homogenous grafts. There is a marked retardation in this process in frozen homogenous grafts. However, there is little difference between frozen homogenous and autogenous transplants when they are completely restored.

COMMENTS

There are probably three factors which influence the success or failure of a frozen homogenous graft, namely, the viability of the transplant at the time of transplantation, the immunologic reaction between the host and graft and the ability of the transplant to stimulate osteogenesis in the host.

The cells of frozen homogenous transplants are not viable. There are osteocytes present when frozen bone is examined under the microscope; but when frozen bone is transplanted

FIG. 5. Frozen homogenous transplant 170 days after transplantation; there are areas of connective tissue change between the areas of new bone formation. Hematoxylin and eosin stain, × 100.

into the host, the osteocytes disintegrate and they possess no osteogenic potential within the graft. Autogenous bone also loses osteocytes when transplanted but those cells closest to the blood supply remain alive. This is not the case of frozen bone. It seems that the more important function of bone transplants is their ability to stimulate osteogenesis.

Immunologic reactions were not studied in these experiments. There have been reports in the literature that blood groups are unrelated to homogenous bone transplants. In studies performed by the author there seems to be little or no antigenicity to homogenous bone.[12]

Frozen homogenous bone transplants have the ability to stimulate osteogenesis in the host. In this way frozen bone transplants are restored to normal consistency. Frozen bone is about 50 per cent slower than autogenous bone in this process. Although the cells are not viable when bone is frozen, the proteins are preserved so that osteogenic stimulation is maintained. Bone chips and cancellous bone can be restored to normal consistency more rapidly than cortical grafts. This is explained by the fact that cortical bone is more difficult to revascularize than cancellous bone because of its relative impermeability. Ultimately the results with homogenous and autogenous bone transplants are very similiar.

SUMMARY AND CONCLUSIONS

1. The fate of frozen homogenous bone transplants is similar to autogenous bone transplants except that they are 50 per cent slower in returning to normal consistency.

2. Frozen homogenous bone transplants are not viable but maintain their ability to stimulate osteogenesis.

3. Bone chips and cancellous frozen bone transplants are superior to frozen homogenous cortical transplants.

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THYROIDITIS*

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THYROIDITIS is a relatively uncommon condition which is frequently overlooked by the internist and surgeon. In the course of our treatment of these cases we have been impressed with several factors, namely, the frequency with which the diagnosis has been overlooked, the difficulty and inconsistent results of the various forms of treatment and the inability of classifying both clinically and pathologically all types of thyroiditis. We believe that a review of the problem in general and a summary of our ideas pertaining to the treatment and a presentation of a few illustrative cases might be of interest. In this review we are not concerned with acute thyroiditis (with or without suppuration) nor with specific infection such as syphilis, tuberculosis and actinomycoses, but only with the more or less obscure, non-specific, chronic thyroiditis. There have been many excellent reviews of this general group but nearly all of them have dealt with the histopathology and etiology of the condition. It can be estimated that approximately 2 per cent of all patients admitted to a hospital for disease of the thyroid gland will have thyroiditis. Osmond and Portmann[6] state that of 251,072 patients registered at the Cleveland Clinic from 1936 to 1947 a diagnosis of disease of the thyroid gland was made in 7,045. One hundred forty-three had some type of thyroiditis and ninety-three had the so-called subacute form.

Hashimoto's disease and Riedel's struma present two divergent extremes of chronic thyroiditis with different clinical and pathologic features. An intermediate group, called subacute thyroiditis, is becoming an acceptable entity although the pathologic and clinical distinction is occasionally difficult. There are other intermediate forms which do not clearly fall into any one of these groups. Even though we are all not in agreement from a pathologic standpoint, it seems reasonable to divide our discussion of thyroiditis into three clinical groups, namely, (1) the struma lymphomatosa of Hashimoto; (2) subacute thyroiditis or the rarer giant cell type of DeQuervain; (3) the struma fibrosa described by Riedel. A great deal of argument has been advanced to the effect that all of these represent different phases of the same process, but the facts do not support this view and it seems to us that the division is clinically sound and useful.

HASHIMOTO'S DISEASE

Struma lymphomatosa (Hashimoto's disease) is a progressive disease of the thyroid gland, first described by Hashimoto in 1912.[4] It is of unknown etiology and most frequently occurs in middle-aged women. Occasional cases have been reported in young women but only a few have been seen in males. There is often a history of goiter of many years' duration with recent enlargement. Early mild symptoms of toxicity may eventually progress to a moderately severe hypothyroidism or at least to a peculiar type of hypometabolism that does not always respond specifically to desiccated thyroid. Often symptoms of pressure will develop from the enlargement of the gland which together with the mild toxic manifestations have been the indications for operations. The correct diagnosis is seldom made preoperatively since the history and symptoms resemble closely those of a colloid goiter. Palpation of a firm symmetrically enlarged gland, associated with mild symptoms of hypothyroidism, and recent enlargement should raise the suspicion of struma lymphomatosa. At operation the gross appearance of the gland is diagnostic. There is a symmetrical enlargement without nodularity or adhesions. The cut surface of the gland has a homogenous flesh pink appearance resembling the cut surface of a lymph node. (Fig. 1.) No colloid material, areas of degeneration or calcification can be recognized, and all lobes are equally involved. There is a slightly lobular appearance caused by the connective tissue septa.

The microscopic appearance of Hashimoto's

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FIG. 1. A gross cross section appearance of struma lymphomatosa.

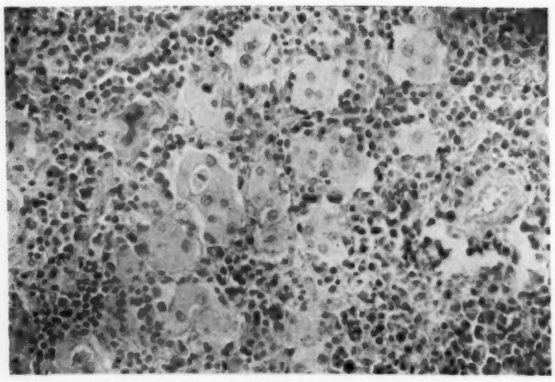

FIG. 2. Hürthle type cells characteristically seen in struma lymphomatosa, × 150.

disease is distinctive. There is marked change of the thyroid epithelium in all areas resulting in small acini composed of thick, cuboidal pale-staining epithelial cells with large vesicular nuclei. (Fig. 2.) These acini contain little or no colloid. Invariably there is a marked lymphoid infiltration with occasional germinal centers. Lymphocyte infiltration is not uncommon in other diseases of the thyroid and this has frequently confused the diagnosis of Hashimoto's disease. The epithelial changes have been consistent in most reports and were described in 1939 by Joll[5] as large acidophilic cells with excessive granular protoplasm and hyperchromatic nuclei. He believes that these were degenerative changes. Parmley and Hellwig[7] in 1940 stated that they were large polygonal cells which resemble hepatic or adrenal cells. Womack and others[10] have described them as "Hurthle type" cells. It is our impression that the diagnosis of Hashimoto's disease should rest upon these epithelial changes rather than on the amount of lymphoid tissue present. Fibrosis is not necessarily prominent and may be related to the duration of the disease.

There does not appear to be any tendency to spontaneous remission of cure of this disease. Some patients have had symptoms and enlargement of the thyroid for several years prior to operation. Three illustrative cases demonstrating the fact that the symptoms of this disease are usually poorly defined and vague and that the correct diagnosis is seldom made preoperatively are reported in detail as follows:

CASE I. A female, aged forty-five, complained of fatigue, 10 pounds of weight loss and a choking sensation in her throat of approximately six months' duration. There were no signs of toxicity present. A moderate enlargement of the thyroid with a nodular feeling right lobe was present. The blood pressure was 120/80, pulse rate 82 and basal metabolism rate plus 8. Other laboratory findings were not significant. A preoperative diagnosis of nodular goiter without hyperthyroidism was made and a subtotal thyroidectomy was performed because of pressure symptoms. A diagnosis of struma lymphomatosa was made. (Fig. 3.) Convalescence was uneventful. She has been observed for a period of seven years and has developed no symptoms of hypothyroidism. A recent basal metabolism rate was minus 10. The patient considers herself entirely well.

CASE II. A female, aged forty-nine, complained of a gradual increase in the size of a goiter which had been present for twenty-five years. This was associated with recent choking sensations. Repeated basal metabolism rates over the past ten years have been within normal limits. Most of her symptoms of nervousness, choking and fatigue had been attributed recently to a suspected menopause. Examination was not significant except for a marked enlargement of the thyroid gland. No nodularity could be felt and a preoperative diagnosis of a colloid goiter was made. Operation was advised because of pressure symptoms.

At operation the diagnosis was obvious from the gross appearance of the gland and a conservative subtotal thyroidectomy was performed. A diagnosis of Hashimoto's type of chronic thyroiditis was made.

Convalescence was uneventful. The basal metabolism rate has remained minus 10, but the patient has the appearance of hypothyroidism and has been given desiccated thyroid daily.

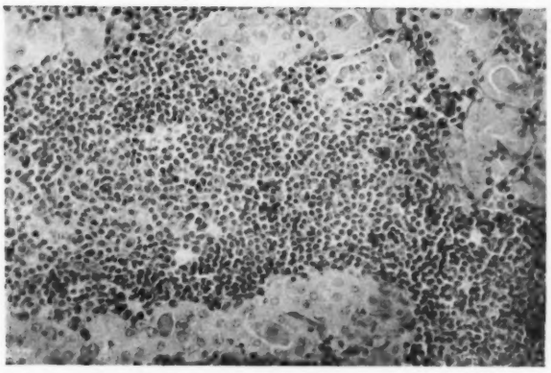

FIG. 3. Case I, lymphoid infiltration with epithelial changes of struma lymphomatosa, × 150.

FIG. 5. Case III, gross specimen of struma lymphomatosa, 300 gm.

The pressure symptoms are completely relieved, but complaints of weakness and fatigue persist.

CASE III. A sixty-three year old female was seen because of a three months' rapid enlargement of a goiter which had been present for forty years. The recent enlargement was asso-

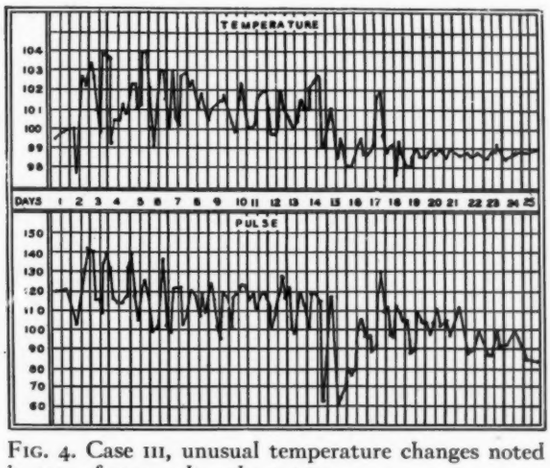

FIG. 4. Case III, unusual temperature changes noted in case of struma lymphomatosa.

ciated with marked respiratory difficulty, fever, weight loss, palpation, weakness and signs of severe toxicity. On examination she appeared acutely ill. She was 5 feet, 4 inches tall and weighed 126 pounds. The blood pressure was 140/80 and the pulse rate 138. There was a firm, diffusely enlarged thyroid which was approximately twenty times normal in size. This was slightly tender to palpation. It was not freely movable and it projected substernally grade 2. The patient appeared anemic, the red blood count being less than four million and the hemoglobin 85 per cent. The white blood count showed 14,000 leukocytes with 41 per cent lymphocytes. There was a sedimentation rate of 34 and a blood cholesterol within normal limits. The basal metabolic rate was not done. She was treated at home for a few weeks with 300 mg. of propylthiouracil daily and Lugol's solution. There was no apparent response to this medication. The gland seemed to increase more in size and there was more difficulty in breathing. She was hospitalized and given oxygen therapy because of her respiratory difficulty. At this time her temperature was 103°F. in the afternoon and it usually returned to normal by morning. (Fig. 4.) The patient obviously was critically ill. Roentgenograms of the chest revealed nothing significant. She was given large doses of penicillin, streptomycin and aureomycin with no improvement. At the same time she was given more propylthiouracil and Lugol's solution.

Our first diagnosis had been that of a rapidly growing malignancy but on later examinations this was changed to an acute thyroiditis. Her condition was considered too critical to permit operation but after multiple transfusions and failure of other conservative forms of therapy it was decided to carry out surgery on her fourteenth hospital day.

At operation a symmetrically enlarged gland without nodularity was found. This was grossly characteristic of Hashimoto's disease and a conservative thyroidectomy was performed. Even then more than 300 gm. of thyroid tissue was removed. (Fig. 5.) The cut surface of it was firm, rubbery with a pink fleshy appearance throughout without evidence of suppuration. All sections showed small closely packed acini and nests formed by thick, epithelial cells. These acini contained little or no colloid and were separated by dense infiltration of lympho-

cytes and plasma cells. A diagnosis of chronic thyroiditis, Hashimoto's type, was made.

The patient's febrile course disappeared dramatically. Convalescence was uneventful and she was dismissed from the hospital on the tenth postoperative day. A long period of convalescence was required and even now several months later the patient feels chronically weak and tired. She developed hypothyroidism and has required 2 gr. of desiccated thyroid daily. Other than for this she is entirely well.

Comment. It is apparent that the diagnosis of Hashimoto's type of thyroiditis is difficult and that the symptoms before operation may be poorly defined and vague. These three cases have been selected from a large group. Cases I and II were characteristic but Case III was selected because it was so atypical. It is unusual to see a patient with such a degree of toxicity and febrile reaction secondary to Hashimoto's disease. It was interesting that this febrile reaction showed no response to antibiotic therapy and antithyroid medication but that a dramatic response was obtained from surgery.

Hashimoto's struma is a progressive disease involving the entire thyroid and it is associated with hypothyroidism, usually of a severe degree. Since the presenting symptoms are usually those of pressure and the preoperative diagnosis is difficult, surgery will probably remain the treatment of choice. It is rare, however, that the experienced surgeon will be unable to suspect the disease by gross examination at operation and in this way be able to carry out a conservative resection of the thyroid, thus perhaps preserving more thyroid function.

It is possible that x-ray therapy would become the treatment of choice if this disease could be recognized more frequently before surgery was carried out. A few cases have been treated in this manner quite sufficiently. A great deal needs to be learned about Hashimoto's disease. In spite of an adequate control of the symptoms, many of these patients continue to be chronically ill for indefinite periods of time. It may be that even a more radical approach to the subject with possible total thyroidectomy and subsequent control of the hypothyroidism by desiccated thyroid should be considered. We believe that pathologically a great deal of confusion in the diagnosis of this condition has arisen from basing the diagnosis on the lymphoid infiltration and not upon the epithelial cell changes.

SUBACUTE THYROIDITIS

Subacute thyroiditis, or as called by some, pseudotuberculous thyroiditis, giant cell thyroiditis or giant cell type of DeQuervain[3] is not yet a clearly defined pathologic entity, due to the varied microscopic findings. It does present a definite clinical picture and until better classification of the problem of thyroiditis is established, should probably be separately classified. The etiology is unknown although virus infection and the close proximity of infected tonsils apparently play some role. It occurs in both men and women of a younger age group generally between thirty to fifty years of age. In the majority of our cases a history of a preceding upper respiratory infection could be elicited. This was usually followed with a persistent sore throat with difficulty in swallowing and pain or stiffness in the neck. The pain radiates from the neck along the lower jaw to the ear and appears to be almost pathopneumonic. Mild toxic symptoms are frequently present and it is not uncommon first to consider this patient as one with hyperthyroidism. On physical examination there is a slightly enlarged tender thyroid gland. This tenderness may be present only in one lobe or a portion of a lobe. Later it may involve other portions of the gland with a recession of the condition in the originating lobe. There may or may not be a low grade septic type of febrile reaction with daily temperature elevations. Laboratory examinations are generally of little value in the diagnosis although a consistent finding seems to be an elevation of the sedimentation rate. The leukocyte count and basal metabolic rate may or may not be slightly elevated. The natural course of the disease inclines towards spontaneous recovery without permanent damage to the gland. This may occur in a period of from two to four weeks, but the majority of the cases will have symptoms for approximately two to three months. We have had some patients in whom symptoms have persisted for more than twelve months. Most patients will remain well enough to carry on their ordinary activities. A few will be so ill from exhaustion, weakness and toxicity that hospitalization is advisable.

Inasmuch as this is a benign process, with few symptoms, subacute thyroiditis is fre-

quently not detected and the patient may be treated for a persistent respiratory infection.

The thyroid in these individuals is quite rubbery and avascular and only slightly enlarged. It may present the gross picture of Riedel's struma except for the absence of surrounding fibrous tissue reaction. The absence of adhesions surrounding the capsule is an important gross differential feature. Microscopically, a true granulomatous reaction is exhibited. One sees a widely progressing degenerative process in the thyroid with destruction of acini in the formation of large pseudo giant cells, increased fibrosis and infiltrations of chronic inflammatory cells. (Fig. 6.) Small foci of acute inflammatory cells may be present. The late stages may be confused with Reidel's struma.

If one considers the pathologic picture of subacute thyroiditis somewhat confused, one certainly must consider the therapeutic problem confused. There is no question but what thyroidectomy will shorten the course of the disease. X-ray therapy and in other instances propylthiouracil, may also influence the course of the disease, yet some of these patients will not be materially influenced by any form of therapy. We have observed some cases for a prolonged period of time and we agree that this type of thyroiditis is a clinical entity. It does not go on to either Hashimoto's disease or Riedel's struma nor in our experience has suppuration occurred. We have selected a representative group of cases to demonstrate some of the outstanding characteristics and some of the difficulties in the therapy of this problem.

Case iv. A female, aged forty-two, was seen three months after the sudden onset of a pain and tenderness in the right side of her neck. Gradually the pain and tenderness moved to the left side and she felt a lump in her throat. She was nervous, noted palpitation, weakness and lost five pounds in weight. The examination was not significant except for the presence of a palpable tender enlarged thyroid gland. Blood pressure was 130/70, pulse rate 120, a basal metabolism rate plus 3, blood count and urinalysis were within normal limits. A diagnosis of subacute thyroiditis was made and the patient was referred for radiation therapy. She was given a total of 800 R in four treatments. The patient tolerated the treatment well and noted immediate improvement. Two weeks later she had had almost a complete subsidence

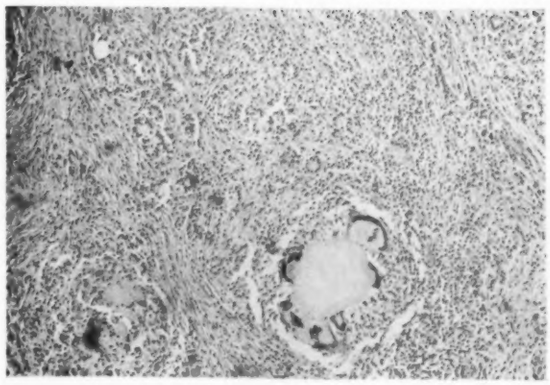

Fig. 6. Case viii, subacute thyroiditis showing pseudo giant cells, fibrosis and infiltration of chronic inflammatory cells, × 100.

of the neck symptoms but there was slight throat irritation, probably the result of the treatment. One month after the treatment all symptoms had cleared, the patient was feeling well and the thyroid gland was soft and had returned to a normal size. She has had no recurrence of her symptoms.

Case v. A thirty year old male physician was seen because of pain in the right side of his neck of five weeks' duration. This was accompanied with stiffness in the neck and difficulty in swallowing. There had been a 1 to 2 degree afternoon temperature rise during this period with an associated general malaise and slight loss of weight. The examination was not significant except for enlargement and marked tenderness of the right lobe of the thyroid. The basal metabolism rate was minus 15 and the sedimentation rate was elevated. He was treated symptomatically and a week later the condition in the right lobe of the thyroid had improved but the left lobe of the thyroid was markedly enlarged and tender. He was hospitalized, given propylthiouracil, and within ten days the entire picture had completely subsided. The thyroid gland became soft and normal in size and he has had no subsequent complaints.

Case vi. A thirty-one year old female developed a diffuse enlargement of her neck following an upper respiratory infection. This was associated with fever, sore throat, headache and palpable tenderness in the thyroid region. On examination she appeared acutely ill, toxic and hyperthyroid. The temperature was 101°F. and the pulse rate 90. She had a pronounced tremor and was emotionally unstable. The basal metabolic rate was plus 30.

There was a leukocytosis of 11,500 with 76 per cent neutrophils and a sedimentation rate of 35. A diagnosis of subacute thyroiditis was made and she was hospitalized for twenty days. Penicillin, Lugol's solution and thiouracil were given without response. The febrile reaction–

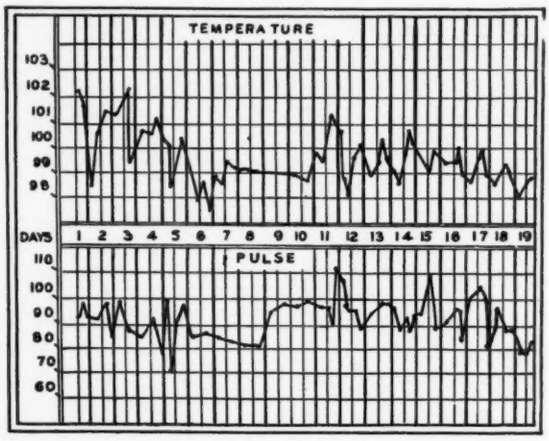

FIG. 7. Case VI, temperature and pulse chart of patient with subacute thyroiditis.

decreased but persisted throughout the hospital stay. (Fig. 7.) She was dismissed from the hospital for economic reasons and treated at home where the febrile course continued for ten weeks. This was associated with persistent findings but of a decreasing degree in the thyroid. The patient was ill from her condition for a period of more than five months. There was a gradual spontaneous remission with no noticeable improvement from any specific type of therapy. At present the thyroid gland is normal in size and consistency, the basal metabolic rate is plus 3 and the patient is without symptoms.

CASE VII. A twenty-eight year old female complained of stiffness and pain in the anterior portion of her neck which radiated to her ears for a period of three weeks' duration. This was associated with loss of weight, tremors and irritability. There was also some menstrual irregularity. The thyroid was enlarged two to three times its normal size and was markedly tender and firm throughout the entire right lobe. All laboratory findings were within normal limits. The basal metabolic rate was plus 3. A diagnosis of subacute thyroiditis was made and she was given x-ray therapy with a total dose of 800 R's in four treatments. No improvement was noted following this therapy. The patient was hospitalized and a dilatation and curettage was performed for the menstrual irregularity but nothing significant was found. She was given penicillin, Lugol's solution and propylthiouracil with no demonstrable benefit. It was necessary to discontinue the propylthiouracil but all other conservative therapy was followed. She continued to lose weight and the pulse varied consistently from 100 to 110. The symptoms which had been originally present in the right lobe subsided and became more prominent in the left lobe. The patient refused to have further x-ray therapy and after a period of disability of twelve months surgery was elected.

A subtotal thyroidectomy was performed. The gland was approximately three times normal in size. It was more friable than normal and there was a fair amount of fibrous tissue present. A microscopic diagnosis of subacute thyroiditis was made. She made an uneventful convalescence and was dismissed from the hospital on her seventh postoperative day. All of the findings referable to the thyroid immediately disappeared and the patient was returned to what she considered normal health within a period of eight weeks.

CASE VIII. A twenty-eight year old female was first seen because of soreness and tenderness in the right side of her throat of approximately one month's duration. This had followed an upper respiratory infection. She had noted a lump in her throat and a diagnosis of goiter had been made elsewhere. She was more tired and nervous than usual and had frequent palpitation. The right lobe of the thyroid was approximately four times normal in size. It felt nodular and was tender. Basal metabolic rate was minus 5. She was treated conservatively with Lugol's solution, rest and vitamins and was observed for a period of approximately one month. The nodules persisted and there seemed to be some increase in the size of the left lobe with tenderness throughout this lobe. A diagnosis of adenomatous goiter with questionable thyroiditis or malignancy was made.

At operation a subtotal thyroidectomy was performed. Both lobes of the thyroid showed active subacute thyroiditis. She made an uneventful convalescence and was dismissed from the hospital on her fifth postoperative day. She was able to return to work six weeks later and has felt perfectly well since this time.

Comment. This group which we have elected to call subacute thyroiditis represents approxi-

mately 70 per cent of the patients with thyroiditis. The diagnosis is not difficult if the condition is looked for and suspected. We have purposely selected a large group of representative cases which have been treated in various fashions to indicate the fact that there seems to be no specific therapy for this condition. We have indicated that it is difficult in many instances to distinguish histologically this form of thyroiditis from that of Riedel's struma. Pathologically, it is reasonable to assume that this is only a stage of Riedel's struma but clinically we have not been able to substantiate this. By far, the most consistently successful form of therapy for this condition has been surgery. We recognize the fact that many of these cases will either clear spontaneously or will gradually subside following some other form of therapy, but we have seen several cases which have responded to no form of therapy other than surgery, such as Case VII. From an economical standpoint it is not reasonable for the average individual to be ill for a period of several months and if faced with the choice of having an operation and a disability not exceeding six to eight weeks the majority would probably elect to have surgery.

Many of our patients have been given x-ray therapy but our experience has not been nearly as satisfactory as that reported by others. Case IV shows the immediate satisfactory response that may be obtained in some of these patients by this form of therapy. Likewise, propylthiouracil such as demonstrated in Case V will occasionally bring about a complete remission of the disease. Case VI is illustrative of the prolonged course which may be maintained by some of these patients if no therapy is carried out. We have tried all forms of antibiotics with no demonstrable results. Lugol's solution has more or less been used routinely in all of these cases, but we have believed that this was more from a prophylactic than a therapeutic standpoint. We think that to recommend surgical treatment for all cases of subacute thyroiditis would be entirely too radical, but on the other hand, to prolong conservative therapy over an extended period of time such as in Case VII is not justifiable.

RIEDEL'S STRUMA

Riedel's struma, or as it is so frequently called, woody thyroiditis, was first described by Riedel in 1896.[8] It is a chronic proliferating, fibrosing, inflammatory process involving usually one but sometimes both lobes of the thyroid as well as the trachea, muscles and other structures in the vicinity of the thyroid. It is most frequently seen in middle-aged women, but it may occur in men. The patient generally complains of discomfort and difficulty in swallowing as a result of pressure on the trachea by the fibrosed gland. The gland is usually not tender. Generally, symptoms of mild hypothyroidism which do not progress to the severity seen in Hashimoto's disease are present. Early in the disease the complaints may suggest hyperthyroidism but these are secondary to the toxic process present. The gland is iron hard in consistency and this, coupled with the smaller size, is helpful in differentiating clinically from other forms of thyroid disease. Grossly, Riedel's struma may be recognized at operation by the extreme fibrosis and adherence to the surrounding structures. The cut surface has a hard, white avascular appearance without recognizable thyroid structure in the involved areas. Crile[1] has frequently found an adenoma in the center of the proliferating fibrous tissue but such has not been our experience.

The greatest difficulty lies in differentiating Riedel's struma from carcinoma. The extreme fibrosis, avascularity and symmetrical enlargement are the distinguishing features of Riedel's struma. Recently one of our associates had occasion to perform a biopsy of the isthmus and the pathologic report was that of Riedel's struma. Subsequent course and autopsy revealed a carcinoma of the thyroid with severe fibrous reaction. In approximately half of our own cases a diagnosis of carcinoma of the thyroid was suspected preoperatively, but fortunately in all cases the true nature of the lesion has been recognized at the time of operation. The microscopic picture of Riedel's struma presents one of extreme fibrosis with obliteration of acini. Scattered pseudo giant cells may be present, and microscopically the distinction between Riedel's struma and subacute thyroiditis presents difficulties. Certainly in much of the literature no attempt has been made to distinguish subacute thyroiditis from Riedel's struma and the description of one matches descriptions of the other disease. This is apparent in Schilling's[9] excellent review of thyroiditis. The main distinction is almost one of degree. There is a more marked fibrosis and destruction of thyroid epithelium present in

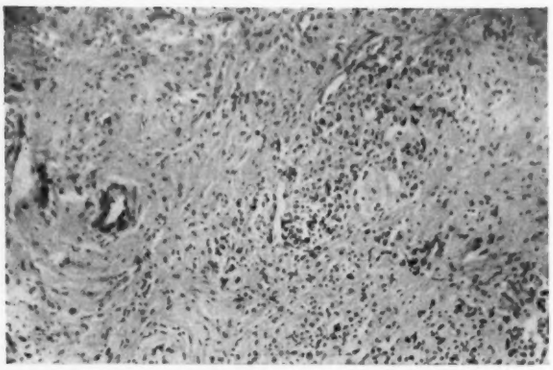

FIG. 8. Case IX, Riedel's struma showing marked fibrous tissue reaction, × 100.

Riedel's struma than in subacute thyroiditis. This has led some to suggest that Riedel's struma may be merely an end result of subacute thyroiditis. Unfortunately, repeated biopsies of the thyroid are not obtained and as yet no convincing series of cases with biopsies at intervals to show the progress of the disease have been reported. In a recent article Crile[2] has suggested needle biopsy of the gland, but due to the inherent difficulties, its use is not widespread.

The treatment for this condition would ideally be to remove all the involved thyroid tissue which in many cases would represent a complete surgical thyroidectomy. Unfortunately, due to the extent of the extracapsular fibrosis and the great amount of chronic inflammatory changes present, this approach is generally not feasible, and it may be utterly impossible. Actually one is primarily concerned with reducing the symptoms of pressure and this can be accomplished in some cases by simply removing the isthmus and suturing the pretracheal fascia to the thyroid. Generally, however, a subtotal thyroidectomy can be carried out removing a wedge from each lobe and the entire isthmus. Subsequently the patient may be expected to develop a varying degree of hypothyroidism. Roentgen therapy has been tried by several and it has not been found to be successful.

CASE IX. A fifty year old female entered the hospital with the chief complaint of a progressive enlargement of the thyroid of approximately one year's duration. This enlargement had been much more pronounced during the past month. She became hoarse and had difficulty in swallowing. This was associated with tenderness, stiffness of the neck and a minimal febrile reaction. She had been treated by her physician on the outside with penicillin, Lugol's solution, propylthiouracil and other measures without improvement.

On examination there was a stony hardness of the entire thyroid gland. It was enlarged approximately four times larger than normal. The pulse rate varied from 100 to 136. Sedimentation rate was 40. Basal metabolic rate was plus10. After two weeks of hospitalization, surgery was carried out.

A subtotal thyroidectomy was performed with technical difficulty. The thyroid was exceptionally firm and adherent to the tracheal and pretracheal muscles. The cut surface was pale gray with white fibrous strands radiating from the center. The microscopic sections were characteristic of Riedel's struma. (Fig. 8.) She made an uneventful convalescence and was dismissed from the hospital on her eighth postoperative day. She subsequently developed a hypothyroidism with a basal metabolic rate of minus 22 and has required desiccated thyroid therapy. Other than for this she has been entirely well.

Comment. We have already pointed out the occasional similarity of the findings in subacute thyroiditis and Riedel's struma. Clinically the findings in Riedel's struma are usually of such a nature that surgery is required for at least diagnostic purposes. It is not uncommon that the preoperative diagnosis of this condition is carcinoma. We think that it can safely be said that no response will be seen in a case of Riedel's struma from any form of conservative therapy and that when pressure symptoms develop there is little or no choice other than to carry out some form of conservative surgical treatment.

SUMMARY

The diagnosis of thyroiditis is frequently overlooked. A review of some of the diagnostic and therapeutic problems together with a presentation of several illustrative cases has been presented. The discussion was divided into the three clinical groups (1) struma lymphomatosa of Hashimoto, (2) subacute thyroiditis and (3) struma fibrosa of Riedel. Certain difficulties of classification pathologically, especially of subacute thyroiditis, were recognized, but no support was given to the idea that these three groups represent different phases of the same process. It was considered that the diagnosis of

struma lymphomatosa should rest upon the epithelial cell changes rather than on the amount of lymphoid infiltration present. The treatment of struma lymphomatosa and struma fibrosa is largely surgical, but x-ray therapy can be considered in the former. No single satisfactory form of therapy for subacute thyroiditis exists, but the results of surgery warrant its consideration in some cases. An unusual case (Case III) of struma lymphomatosa showing marked febrile and toxic reactions has been presented.

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POLYPS OF THE LARGE INTESTINE*

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CANCER is one of the two most frequent causes of death today. Everyone is interested in its prevention and early diagnosis. Much has been written regarding polyps of the large intestine and all agree concerning the serious nature of this lesion. In itself benign, a polyp has grave potentialities and should be considered a problem for surgical intervention as soon as it is recognized. Cases will be presented to stress the fact that procrastination, indecision and temporizing procedures may result fatally. It is the belief of many that every polyp if left long enough will develop carcinoma. If this is true, then in order to prevent carcinoma all polyps must be removed.

By far the most important factors in an examination for polyps are an awareness of their incidence, location and the willingness to do routine procedures. There are only three methods of detecting simple polyps before complications arise: (1) *Rectal examination* must be routine. (2) *Proctoscopic examination* serves to confirm a low polyp felt on rectal examination and also to visualize those higher in the rectum and sigmoid, up to 25 cm. from the anal orifice. Through the proctoscope specimens can be taken for biopsy. (3) The last method is *x-ray examination*. By means of ordinary barium enemas many polyps can be seen; also, many will be missed. The double air and barium contrast method offers the best opportunity for making the diagnosis. With this the polyp is coated with barium and outlined by air. This will not completely rule out the possibility of polyps; and if there is sufficient clinical evidence, this examination should be repeated.

It is possible for polyps to develop after an intensive search. Repeated examinations should be made in families with polyposis and in follow-up of patients after polyps have been removed.

For the most part simple polyps of the large intestine cause no symptoms even when they are multiple. The most frequent complaints are bleeding, passage of mucus and diarrhea. In addition abdominal cramps, anorexia and loss of weight occur. These symptoms are caused by the following complications: infection and ulceration, intestinal obstruction when the polyps have attained sufficient size, intussusception and malignant transformation.

Polyps occur throughout the gastrointestinal canal including the esophagus, stomach, duodenum, jejunum, ileum and large gut. Ravitch[1] has recently presented a case in which polyps were present simultaneously in all the aforementioned locations except the esophagus. They tend to occur in one part only in many individuals although at autopsy they are often scattered. The large intestine is the favorite site for such growths.

Polyps occur as a complication of inflammatory processes such as ulcerative colitis, amebic dysentery and tuberculosis. They are called pseudopolyps. In 1,600 cases of chronic ulcerative colitis Wessen and Bargen[2] found inflammatory polyps in 10 per cent. Single or multiple carcinomas have appeared superimposed on the underlying colitis in 2.5 per cent of those patients with chronic ulcerative colitis. Earlier observers, including Swinton and Warren,[3] state they have never seen carcinoma develop following ulcerative colitis. Cave[4] in following ninety-eight patients with chronic ulcerative colitis over a period of years has seen carcinoma develop in ten, or 10.2 per cent. Kingsbury[5] treated one patient with polyps secondary to ulcerative colitis using x-ray therapy. A total of one skin erythema dose was given and in two months all polyps had completely disappeared. Hamilton et al.[6] had a patient with multiple polyposis following amebic dysentery upon whom a complete colectomy was performed with relief. Buie et al.[7] in treating 1,640 patients with polyps report that eighty-two, or 5 per cent, occurred as a complication of ulcerative colitis.

The term polyp is used for a tumor arising from the mucous membrane and attached to

* From The New York Hospital and Cornell University Medical College, New York, N. Y. Presented before the New York Surgical Society, November 9, 1949.

that mucous membrane by a pedicle. They may be single or multiple, benign or malignant, sessile or pedunculated. There is a very interesting group of polyps called by many names which we designate as polyposis (heredofamilial polyposis, adenomatosis, multiple polyposis, diffuse polypoidosis, intestinal polypoidosis, intestinal adenomatosis). These polyps occur at an early age in many numbers, with a definite familial tendency, and almost invariably progress rapidly into fatal cancer unless irradicated.

The cause of polyps is not evident. Swinton and Warren[3] think the large majority are true tumors and the result of inherent defects in cellular growth. Dukes[8] says the first effect of the carcinogenic agent is that the epithelial cells of the mucous membrane covering an extensive area of the bowel are stimulated to more vigorous growth in many separated areas. This may be recognized microscopically even before irregularity of contour can be distinguished by the naked eye. Later a crop of adenomas arise from this sensitive field and some of them become surrounded by secondary tumors. The mucous membranes in the clefts between primary and secondary tumors are hampered in their growth and become folded inward. Possibly these dislocated cells are the first to undergo malignant change.

Polyposis exhibits a definite familial tendency although it is not congenital. Lockhart-Mummery[9] says it is handed down from one generation to another either as a mendelian dominant or recessive. It is transmitted by both sexes and attacks both sexes. Children are not born with this disease but may develop it at any early age, usually about puberty. Lockhart-Mummery also is convinced that this condition is an example of gene mutation. He concludes that the hereditary factor is the susceptibility of the epithelial cells of the large intestine to proliferate at a certain age. This results in the formation of numerous simple adenomas throughout the large intestine. The actual number in any individual case often is so great they cannot be counted. The other feature of particular interest is that after a certain time there is a marked tendency for one or more of the adenomas to form a starting point for cancer; thus cancer may develop at an early age.

Many family trees are shown by writers to support the familial tendency of polyposis. The first writer was Scripps in 1882; however, Friedel and Wakefield[10] call attention to the fact that in only about one-half the cases of polyposis is it possible to demonstrate a definite hereditary tendency. This is explained by some authors on the basis that patients know little about their family history and the condition has not had time to develop in other members of the family.

As the carcinoma develops, first in a small portion of the polyp and then spreads to involve the entire polyp, we have both an aid and a hindrance to therapy. If the polyp is pedunculated and there is no invasion of the pedicle, even in fully established carcinoma, only resection of the polyp may be necessary. Such a polyp is called adenoma malignum. On the other hand, biopsy of a polyp may not contain the cancerous area and may give rise to an incorrect diagnosis. The following case illustrates the difficulty in waiting for a positive diagnosis of carcinoma before resorting to surgery:

Case 1. W. C. (New York Hospital No. 179 219), a forty-three year old white male, was first seen in the clinic with a history of diarrhea and bloody discharge from the rectum of one year's duration. Proctoscopy showed multiple polyps in the rectum. The biopsy report was "pre-carcinomatous polyp of rectum." Barium enema showed polyposis of the colon. The diagnosis was polyposis without evidence of malignant change. The patient was discharged to be followed up in the clinic. He was observed for three years during which time nine proctoscopies, eight barium enemas and seven biopsies were done before a diagnosis of carcinoma was made. At operation polyps were present in the sigmoid and transverse colon. A transverse colostomy was performed. From a point distal to the colostomy and including the rectum the remainder of the large bowel was removed. This specimen was studded with polyps and showed two carcinomas, one of the colon and another of the rectum with metastasis to the regional lymph nodes. Two months later two polyps were removed from the colostomy stoma. The patient died two years later with metastasis to the intra-abdominal lymph nodes.

There is little question of a direct relationship of polyps to carcinoma. As the polyps increase in number, so does the incidence of carcinoma until in polyposis carcinoma will develop in almost all patients and at a relatively early age. Hino,[11] at the Tokyo Imperial University, in 394 dissected cadavers found sixty-

nine with intestinal polyps, or 17.5 per cent, the favorite site being the mucosa of the colic segments. In cadavers of patients over forty years of age there were sixty-two with cancer of which twenty-four, or 39 per cent, had polypi.

Lawrence,[12] at the Cook County Hospital, in 7,000 autopsies found polyps in 166, or 2.37 per cent. In six instances polyps were malignant. He found polyps most frequently in the fifty- to sixty-year age group.

Scarborough and Klein[13] in reviewing 10,000 patients seen and examined by them found 458 with presumably benign polypoid disease, or 4.6 per cent; 64 per cent of the polyps were single, 31 per cent had from two to nineteen polyps and there was polyposis in 5 per cent.

In reviewing autopsy reports at The New York Hospital, in ninety-two patients who at one time had carcinoma of the large bowel polyps were present in thirty, or 33 per cent. It is interesting that the late Charles Mayo[14] reviewed 334 patients who died of primary carcinoma of the colon or rectum and found 114, or 34 per cent, had polyps in addition to the primary neoplasm. He found twice as many polyps of the colon present in cases in which actual symptomatic cancer existed as in the control group in which malignancy was unsuspected. Mayo also states that some patients after radical operation for cancer do not have recurrence but develop a new primary carcinoma which might be avoided by searching for polyps.

Case II. J. H. (New York Hospital No. 178 007), a sixty-three year old male came to the clinic because of rectal bleeding and pain of two years' duration. His family history disclosed no evidence of carcinoma. Proctoscopy revealed three polyps. The biopsy report from one was adenocarcinoma. Barium enema showed an obstructive tumor at the rectosigmoid junction. A transverse colostomy for sigmoid carcinoma was performed and two weeks later an abdominoperineal resection with sigmoid colostomy was done. The specimen showed two polyps 13 cm. from the anus. Twenty centimeters above the anal ring was a carcinoma growing in a mushroom-like expansion from a small base. In addition a polyp was near the carcinoma. One month later the transverse colostomy was closed. The sigmoid colostomy failed to function and the patient showed signs of obstruction; the transverse colostomy was opened four days later. X-ray examination revealed obstruction in the region of the splenic flexure. One year later a polyp was seen in the transverse colostomy opening. Barium enemas at this time were interpreted as showing carcinoma of the splenic flexure. Three months later the colon distal to the colostomy was removed. This specimen showed carcinoma and the mucosa was everywhere studded with polyps of various sizes. The patient died seven months later in the Cancer Institute.

Here treatment of cancer of the rectosigmoid was complicated by the presence of carcinoma of the splenic flexure and numerous polyps.

Swinton and Warren[3] in reviewing 156 patients with polyps found malignant polyps in 121 cases, or 77 per cent. They believe polyps are true tumors which are premalignant and all should be removed; that symptoms due to early benign polyps are rare; and that malignant change can start anywhere in polyps. In their series of malignant tumors of the colon and rectum 14 per cent started in benign mucosal polyps.

Guptill[15] in reporting on five patients with polyposis found malignant degeneration in 80 per cent, and in 40 per cent carcinomas were present.

Polyps frequently occur in children under the age of twelve years. Although we speak of congenital polyposis, no one has reported polyps in the newborn baby. The earliest polyps to be described were in infants six months of age. These patients present themselves with symptoms of bleeding, mucus discharge or diarrhea. Self-amputation occurs frequently in children but rarely in adults. Kerr[16] in 100 children found a single polyp in sixty-eight whereas thirty-two had more than one. In only one patient did he find heredofamilial polyposis. This patient's father had had a colectomy for carcinoma at thirty-four years of age.

Polyps in children may cause complications such as severe bleeding, anemia, intussusception and cancer. Although the tendency for malignant change in polyps is not great until puberty, it does occur. Kerr reported the case of a twelve year old boy with intestinal obstruction. At operation carcinoma of the large bowel had already metastasized to the regional lymph nodes and liver. This patient had been passing bloody mucus since the age of three.

Kennedy[17] reported from the Mayo Clinic on forty-nine patients under thirteen years of age who had polyps, including three with diffuse

polypoidosis. Tissue was obtained for diagnosis in eighteen of the forty-nine cases in which eight were called adenocarcinoma, Grade I, and one adenocarcinoma, Grade II. Apparently all Grade I adenocarcinomas were cured without radical operation.

For treatment all agree that polyps should be removed. X-ray therapy has been used for polyposis by Vanzant,[18] McKenney,[19] and Chandler and Newell.[20] They state that it is not curative although it may relieve symptoms for a time. Carcinoma developed in five of the patients treated with x-ray therapy.

Single polyps can be removed through the proctoscope, by incision of the intestine with excision of the polyp or by resection of the intestine including the attached polyp. When there are two or more polyps, a combination of the aforementioned methods can be used.

There is little argument as to what constitutes a typical case of polyposis of the colon. However, in a large percentage of cases the diagnosis is not clear-cut. We do know that the more polyps present, the more likely is death from carcinoma. When the entire large gut is involved in polyposis, the best treatment is total colectomy. Ileostomy with complete removal of the colon and rectum is curative from the standpoint of cancer prevention. In order to meet objections of the patient to ileostomy some leave the rectum and anastomose the ileum into this. They then attempt to remove polyps in the rectal stump by fulguration. Lillienthal[21] did such an operation on June 15, 1900. Rankin[22] on a basis of his experience thinks in certain selected cases the rectum can be left in place and lesions fulgurated as they occur.

Buie et al.[7] reported a series of 1,640 patients with polypoid disease of the lower colon. Of these 1,287 were fulgurated through a proctoscope. In using this method they state that much care must be used in selecting the patient.

Miller and Sweet[23] reported on two patients with polyposis in whom carcinoma had developed; one patient had three distinct cancers. Here complete colectomy including the rectum was performed leaving the patient with a permanent ileostomy.

Case III. S. F. (New York Hospital No. 485 118), aged forty-three, was treated in the psychosomatic clinic eleven months and seen twenty-three times. During the last three months of this period, abdominal pain developed. X-rays showed polypoid carcinoma of the cecum or ascending colon. Proctoscopy showed a polyp 8 cm. inside the rectum. A biopsy of this polyp was interpreted as carcinoma. The polyp of the rectum with 2 cm. of normal mucosa was removed. The pathologic report showed "carcinoma of the rectum" Five days. later a right colectomy and ileostomy were performed. In the ascending colon was a colloid type carcinoma 5 cm. in diameter. Four centimeters distal to this was a polyp 1 cm. in diameter. Because of the double carcinoma two weeks later the remainder of the colon was removed down to the rectosigmoid leaving the patient with a permanent ileostomy. This portion of the colon contained no polyps. Three weeks later an abdominoperineal resection was performed removing the rectum and remaining sigmoid. Examination of the rectum showed no evidence of carcinoma; apparently this had been completely removed by polypectomy. When last seen eleven months later the patient had gained 30 pounds in weight but was fearful of another operation. She was having minimal discomfort due to the ileostomy. There were then two small polyps on the mucosal surface of the protruding ileum ½ cm. in diameter. One, removed for biopsy, showed chronic inflammation.

Here a very radical procedure was performed because of carcinoma of the cecum and rectum together with a polyp of the ascending colon.

Many have tried to obviate the ileostomy by leaving the rectum, fulgurating the polyps there and then anastomosing ileum into rectum. Obviously this has the disadvantage that carcinoma may develop in the rectum as has occurred in a number of these patients.

Case IV. R. S. (New York Hospital No. 87 653), a white female thirty years of age, was admitted with a history of diarrhea for seven to eight years. For the past five years there had been blood and mucus in the stools. Her mother had died at thirty-seven from carcinoma of the cecum and her father of an intestinal cancer, site undetermined. Two months previously a diagnosis of polyposis had been made in another hospital; the patient had been placed on a low residue diet and advised to have no surgery as long as her condition was good. She was admitted for colectomy. Biopsy of the rectum revealed no carcinoma. It was planned to do a two-stage procedure ending with an ileoproctostomy. At the first procedure the ileoproc-

tostomy was performed. Six weeks later a colectomy was performed removing the entire colon down to the rectosigmoid and closing the rectal stump. The surgical specimen showed numerous polyps; in one large polyp precancerous changes were present. Six days after operation the patient died of peritonitis. At autopsy carcinoma of the rectum was present.

In this case it was planned to leave the rectum; but before the operative procedure was completed, carcinoma was found in this site despite a previous negative biopsy.

Maisel and Foot[24] reported a case from this clinic of a thirty-four year old woman upon whom perineal resection for carcinoma of the rectum and a right hemicolectomy with ileotransverse colostomy for carcinoma of the cecum were performed, leaving a portion of the colon but not doing an ileostomy. The specimen removed also contained polyps in the ascending colon. A follow-up of this patient (A. S., New York Hospital No. 402 190) three years later found her pregnant with polypoid tissue again protruding from the rectum. On proctoscopy numerous polyps were seen up to 15 cm. from the anal orifice. Barium enema showed no polyps and biopsy revealed no cancer. The child was delivered by cesarean section followed with total hysterectomy. An air contrast enema showed large polypoid masses in the distal colon. The lower bowel was resected, removing 18 cm. of rectum containing five benign polyps. The patient was discharged with a colostomy. It is possible that polyps will develop in the remaining colon.

Ravitch and Sabiston[26] in experiments on dogs have performed anal ileostomy with preservation of the sphincter at the same time, doing a total colectomy. They report one patient with ulcerative colitis upon whom this procedure was performed. After three months the result was satisfactory. This operation had been reported by others for ulcerative colitis and may be of real help in patients with polyposis when an ileostomy is dreaded.

SUMMARY

1. Polyps of the large intestine are frequent. They are usually single but increase in number until in certain patients they become uncountable.

2. Any polyp may develop into carcinoma. The more polyps, the greater tendency for carcinoma to form.

3. All polyps should be removed.

4. When carcinoma of the large intestine or rectum develops, one should redouble efforts to remove all polyps, even at the cost of radical surgery.

5. In polyposis a complete colectomy with proctectomy should be performed. An anal ileostomy may prove superior to the abdominal type of ileostomy.

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WHEN a supernumerary breast is present in the axilla, it should be removed not only for cosmetic reasons but also because it may secrete milk after parturition. Often it is traumatized and malignancy is always a potential danger in such cases. Again diagnosis may be difficult, especially if breast tissue is present without a nipple, as then it often is misdiagnosed as a lipoma. On the other hand, some patients have an extra nipple in the axillary region with no breast tissue beneath it at all, or only a rudimentary gland is present. When there is doubt, if the axillary mass behaves like normal breasts during and after the menses, one is justified in suspecting axillary polymastia. In excision one must be on the lookout for axillary prolongations, otherwise the supernumerary gland will not be completely excised and subsequent recurrent symptoms may necessitate reoperation. (*Richard A. Leonardo, M.D.*)

Modern Operative Technics

No. 5

OPEN METHOD OF FREE SKIN GRAFTING

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WE distinguish three different methods of free skin grafting which we have named the open, closed and intermediate methods. In the open method[6] no bandages are placed over the grafts, i. e., they are left open to the air or covered only with a single layer of bobbinet or a single layer of vaseline gauze as described in previous articles. In the closed method[6] bandages are placed over the grafts. In the intermediate method no bandages are placed over the grafts but a shell of wax or plaster of paris bandage is placed directly on the grafts to serve the purpose of protection and immobilization.[6] This article deals with what we believe to be the fundamental factors involved in free skin grafting as demonstrated under direct vision, i.e., the open method.

It is common knowledge that the body will attempt to repair its tissues after injury. However, the true nature of the substances which are liberated after injury to stimulate dormant cells to active proliferation and final repair are still largely unknown, although under active scientific investigation since Virchow in 1852 first promulgated his "Hormone Theory of Wound Healing." Nevertheless, we have sufficient anatomic, physiologic and pathologic facts coupled with factual clinical experience to bridge this gap of the unknown and permit us to formulate our basic principles of surgery.

Our interpretation of successful free skin grafting, which we believe accounts for the essential facts, is based on the original work of many others, notably Sano. We believe that the body strives to heal as quickly as possible, i.e., by first intention, and compromises on delayed or secondary healing. The difference between a wound healed by first intention and a wound healed by second intention is the difference between a small amount and a large amount of scar. The more quickly a wound heals, the less likelihood there is of infection, wound complications and scarring. We attempt to control conditions in order to get quick or first intention healing.

It is an accepted fact that the best time for free skin grafting is immediately after an injury or operation if conditions are suitable for this procedure. At this time primary tissue, the free skin graft, can be placed in contact with primary tissue, the body, with no secondary tissue intervening. We attempt to duplicate these conditions in our method of free skin grafting.

Important subjects to be considered are the skin itself, infection, tissue fluid, secondary tissue and protection. A few facts are selected from these very broad subjects to form the basis of our technic.

Skin. This organ, which some authors state has more functions than the liver, is developed from two embryonic layers. The outer layer, the epidermis, is developed from the ectoderm; the deeper layer, the dermis, is developed from the mesoderm. The epidermis is attached to the body by the dermis, and from the dermis it receives its nourishment.

The epidermis has no direct blood supply. It lives on tissue fluid which seeps into it from the dermis. Our problem then is to set the stage so that ever flowing springs of tissue fluid will immediately and permanently seep from the body to the transplanted epidermis for its immediate and permanent growth. Since every living cell in the body is bathed in some form of tissue fluid, it follows that epidermis would probably grow if properly applied on a variety of body tissues. We know that it will grow on fat, muscle, tendon, bone and intestine, and if occasion ever demanded, these fields of growth could probably be broadly expanded. (Figs. 1 and 2.)

The dermis has a direct blood supply. It

therefore cannot be completely detached from one part of the body and transplanted to another part without undergoing either total or very considerable destruction. Consequently, with few exceptions attached grafts are necessary to transplant it.

Infection. With a wound completely healed with scar, local infection is no problem. Any of the usual methods of antisepsis is sufficient.

With a very early healing wound when we know the collagenic tissues are thin and soft, the area is gently washed with peroxide, soap and water followed by a thorough washing with normal saline solution.

In the case of a late healing wound when we know the collagenic tissue is thick and firm, the adjacent tissues are washed with soap and water followed with an antiseptic. A pure lunar caustic pencil is then swept back and forth over the capillary tufts in order to cauterize them and the bacteria which cover their surface. We know that every type of organism will be destroyed if we cauterize all of the capillary tufts with 100 per cent silver nitrate. Normal saline is poured over the surface to wash off the silver nitrate and tissue slough, and also to change the silver nitrate to insoluble silver chloride. All secondary tissues are then swept off with a scalpel down to primary tissue.

Tissue Fluid. Every living extravascular cell in the body is bathed in a current of some form of tissue fluid. Tissue fluid accumulates around the cells in the intercellular spaces from seepage through the endothelial lining of the vascular system. It is drained from the intercellular spaces by seepage through the endothelial lining of the blind-ended capillaries of the lymphatic system. Products necessary for the nourishment of each individual cell are derived directly from tissue fluid, and waste products from the cells are eliminated directly into tissue fluid.

Clot. Blood or plasma clot is body glue. Its functions are to bind, to cover, to protect and to supply injured tissues. It serves as a temporary plug to establish continuity of injured tissues.

We depend upon the internal binding or gluing function of clot to stick the free graft to the body, and do not depend upon the external pressure of bandages in an attempt to achieve the same result. All wound healing, we believe, is predicated on the presence of clot, and from this clot we have developed our technic. Blood serum, which is squeezed out of the clot, probably serves as an emergency supply of nutrition until slower physiologic processes in the clot can establish themselves.

Secondary Tissue. Granulation tissue, which is highly resistant, is a mass of capillaries and fibroblasts. It matures into only one type of tissue, scar tissue. It never changes its character; it never takes on the function of any organ in which it is found. By its nature in its mature state, avascular scar, it is evident that this substitute tissue functions as a permanent plug to establish continuity of injured tissues.

When tissue is injured, its metabolic activity is lowered and specialized cells are adversely affected. Quite the opposite effect is noted with white fibrous connective tissue, an unspecialized tissue. Dormant fibroblasts are stimulated to active proliferation in tissues whose metabolic activities have been diminished by injury.

In a quickly healing wound the adjacent normal body cells are little affected, metabolic activity is high and fibroblastic proliferation is reduced to a minimum. Scarring is slight.

In a delayed healing wound layer upon layer of fibroblasts and their non-viable product, collagen, are laid down until in old granulating wounds this collagenic secondary tissue is thick, hard, blanched and of almost scar-like consistency. Complete healing results in excessive scar.

It has seemed illogical to us to graft a specialized tissue such as epidermis, which has a relatively high metabolic rate, on a thick layer of unspecialized tissue such as white fibrous connective tissue, which has a low metabolic rate, and expect it to function permanently in a normal manner. We eliminate all stages of secondary tissue except in very early cases and in those late cases when the condition of the patient is such that surgery must be reduced to a minimum.

Free skin grafting will control the inflammatory process in the wound itself and, also, in the adjacent tissues. This is probably due to an elevation of the metabolic activities of the parts after grafting to a point above the level of secondary tissue stimulation. Not only is the proliferation of fibroblasts controlled, but also there is slow absorption of some of the nonviable products of the fibroblasts, collagen. Nevertheless, in the interests of our primary

objective, quick healing with little scar, we surgically eliminate all secondary tissue whenever possible. By eliminating the secondary tissue the body is permitted to reform something similar to the fragile network of lace-like fibrous tissue normally found between the dermis and the epidermis.

Granulation tissue seldom becomes infected. Why it is so resistant to infection is not known. Because of this resistance to infection almost unlimited liberties can be, and are, taken in the use of bandages. We use bandages as little as possible over free skin grafts and over open wounds, using the open methods as described in this and in previous articles.

The value of pressure dressings over open wounds decreases in direct proportion to the difficulties encountered in bandaging the parts involved. These difficulties are physiologic as well as physical.

Over open wounds bandages serve all of the requirements for bacteria culture: a perfect culture media, body fluid in a dark, damp environment at an optimum temperature. Fortunately, granulation tissue does not seem to concern itself with myriads of bacteria and necrotic body fluids which may cover its surface.

Unless bandages over open wounds are changed frequently, the patient is forced to bear the odor of his necrotic wound which is disgusting to himself, an abomination to those bedridden near him and a trial to the nurses and doctors who are forced to take care of him. Methods previously described, we believe, are more desirable.

The clinical experience of Doctors John J. Hammett, James J. Morressey and ourselves has led us to believe that the effect of ACTH in controlling fibroblastic proliferation is not due to any direct inhibitory influence on these cells as such. It is probably indirectly due to increasing the metabolic activity of depressed normal body cells in the wound area where possibly a condition of local shock exists to a point where fibroblastic proliferation is not stimulated. This would simulate conditions in a wound which is healing by first intention.

After observing the firm, clean character of wounds following separation of charred skin in patients treated with ACTH we have concluded that altered or depressed cells in the wound area have either increased their metabolic activity to a point where they can actively resist infection, or else have become insensitive to their toxins. Within this healthy area living epidermal cells may be scattered which, because they are not destroyed by infection, will proliferate and cover areas which otherwise would have to be skin grafted.

As far as the skin is concerned the cells of this specialized tissue, which has a rather high metabolic rate, would more likely be stimulated to active proliferation because of this increased metabolic activity than be depressed by it. Quite the reverse would happen with white fibrous connective tissue, an unspecialized tissue with a rather low metabolic rate. Its cells are stimulated to proliferation in low metabolic areas. If the metabolic rate of the areas is increased, stimulation is lost and proliferation of fibroblasts will be reduced to a minimum. Conditions similar to a wound healing by first intention would thus be obtained.

Protection. As the result of our experience with free skin grafting under direct vision, i.e., the open method, we have concluded that protection of the properly applied free skin graft is the essence of success in free skin grafting. The method of protection will vary with conditions and the grafted locations. Any smooth area not subject to trauma or which can be easily protected from trauma, not subject to twisting, wrinkling or excessive movements and not a juvenile, can be successfully free skin grafted without any bandages over the grafts. Adults can be instructed on what to do and will usually follow instructions. Children must be protected otherwise.

Complete immobilization of a free skin graft is not necessary for success. Soft undulating movements do not disturb the grafts which are held to the body by an elastic clot. Acute movements such as might cause wrinling will lift the grafts along the wrinkles, fluid will accumulate under the wrinkles and the graft may be lost.

Protection in some cases might be nothing more than instructing the patient on what to do. Other times it might mean the use of a cradle, suspension of the part, use of a light protective local shield, light fluff padding to prevent clothing from rubbing over the grafts or immobilization of parts adjacent to the grafts.

When no sutures or bandages are to be used, the grafts are backed with either vaseline gauze or bobbinet as described in previous articles. If bobbinet is used, the adjacent skin

1A 1B

FIG. 1. A, Photograph taken one and a half years ago when the patient was twenty-seven years of age. History of hot water burn when nine months of age. The face is completely scarred with ectropion of both upper and both lower eyelids, scar of the cornea, eversion of both lower lateral cartilages and partial atresia of both nasal cavities. B, recent photograph showing results of free skin grafting by the open method one and a half years ago. The forehead, nose and upper cheeks were covered with a single piece of split skin cut with a Padgett dermatome. The graft was sutured in place and no dressings were placed over it, i.e., it was left open to the air, being "fixed" in place by clot. The eyelids are formed from scar which was "crowded" from the skin graft area.

2A 2B

FIG. 2. A, Photograph of an adult taken nine years ago showing keloid type scars which formed following a fire burn. B, recent photograph taken eight years after free skin grafting of the nose, upper lip, cheeks, chin and upper neck by the bobbinet open method. A Padgett dermatome covered with bobbinet was used to cut the grafts. No dressings were placed over the bobbinet and no sutures were used. The bobbinet was pasted around the borders of the recipient area which had been painted with rubber cement. At the first stage the nose and lip were covered. At the second stage a pattern graft was cut to cover the cheeks, chin and upper neck. The mandible was not immobilized.[10]

is painted with rubber cement and either bobbinet or adhesive plaster strips are used to anchor it along the wound margins. Sometimes we use sutures and no bobbinet or vaseline gauze. Around acute movable angles, as at the extremities of the oral and ocular fissures, we use sutures. (Fig. 3.)

We do not believe that bandages in free skin grafting serve any physiologic purpose whatsoever. They are merely physical agents (negatives of the graft areas) whose functions are to protect the skin grafts and exactly fit them against the irregularities of the host in order that clot may carry on its physiologic functions. We deduce that the question of controlling edema by bandages over the graft area is either erroneous or, if true, is unimportant.

Color changes in a healing free skin graft as observed under direct vision vary. With a light-skinned individual the usual range is from the light color of the free skin graft through a mottled pink, a dusky pink and then light mottling to a final color which is permanently lighter than the area from which it was taken. Sometimes there is no mottling at all; the graft becomes pink and regresses to its final lighter color. Occasionally the graft becomes mottled and dusky followed with a confluent deep blue or purple. This is followed with pink mottling and finally the last color, which is a little lighter than the skin adjacent to the donor area. Dark-skinned individuals may show permanent darkening of the grafts and permanent mottling. The various changes in color are probably due to variations in thickness of the grafts and the character of the recipient areas.

TECHNIC

The host area is prepared as previously described. Success depends upon absolute control of oozing. If the host area is too dry, a few cubic centimeters of blood are withdrawn from a vein and lightly sprinkled over the recipient site in order to form a minute film of clot. A clotting agent is sprinkled over the raw surface of the graft for no other reason than that it causes quick clotting when the graft is applied to the recipient area and thus assists in mechanically fixing the free skin graft. The graft is lightly massaged until it has a "fixed" feel. Damp gauze is lightly tamped along the borders to absorb any fluid which is pressed out by massage. The operation is then complete and the postoperative type of protection is decided upon.

Closed Method. Areas which have a grossly uneven base, areas which are subject to trauma or excessive movements, and juveniles usually must be bandaged. In such cases we use any type of bandage which we deem suitable for the case. When bandages are used, we attempt to make them small and well fitting. If they are subject to rubbing, we incase them in light plaster so that the bandages are not disturbed by the bed sheets.

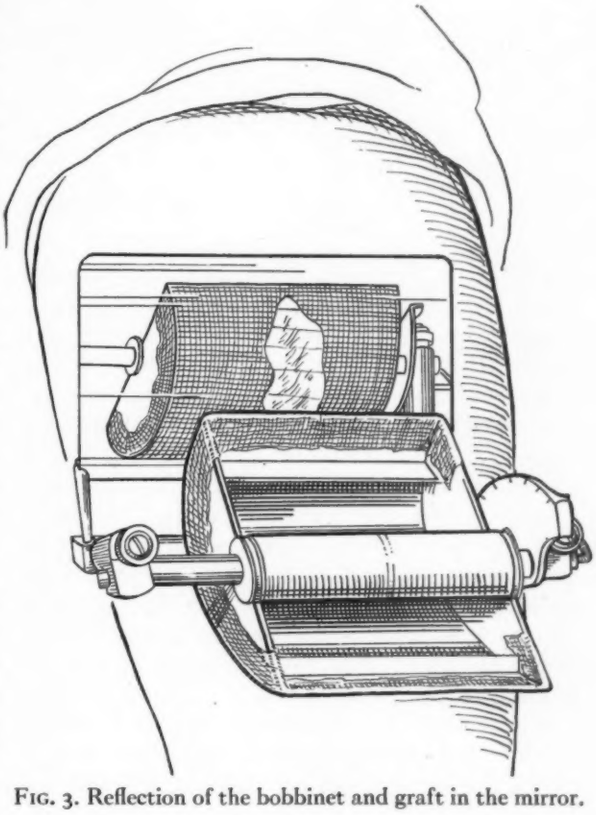

FIG. 3. Reflection of the bobbinet and graft in the mirror.

Intermediate Method. This method is of limited use. Wax is softened by immersion in hot water and then draped over the graft area directly on the grafts. Since the wax is held in the hand during this procedure, there is no possibility of applying it too hot. Adhesive strips or gauze hold it in place.[6] Difficulty will be experienced when removing the plaster of paris covering unless vaseline gauze or vaseline is placed over the rubberized fabric, if this is used. Plaster bandage strips are sometimes applied directly over the free skin grafts as

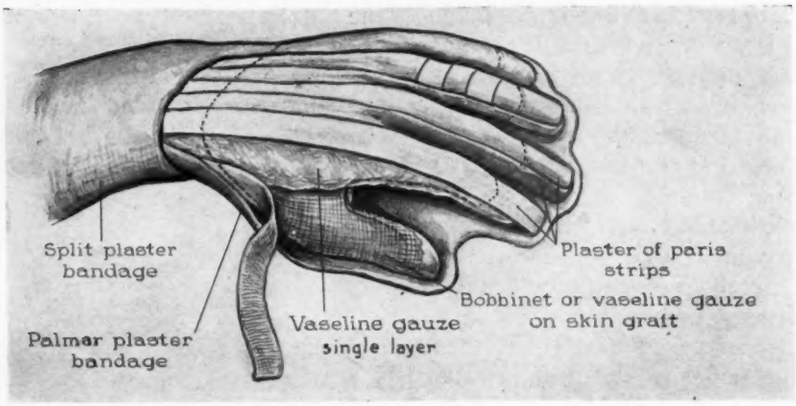
Split plaster bandage
Palmar plaster bandage
Vaseline gauze single layer
Bobbinet or vaseline gauze on skin graft
Plaster of paris strips

FIG. 4. Intermediate method using plaster of paris strips. The wax method may also be used.[6,7]

indicated in Figure 4. This serves the purpose of protection and immobilization.

Advantages of the Open Method. The grafts are under direct vision at all times so control is absolute. The patients require little attention. This is reflected in the limited use of trained personnel, equipment and bandages. Early mobilization of the patient is possible in many cases of grafts above the abdomen. Use of the open method places many small skin graft procedures in the field of minor surgery. The value of the open method in free skin grafting increases in direct proportion to the difficulties which would be encountered by attempting to bandage the parts involved.

Donor sites are treated as scuffs. A single layer of dry gauze is laid on the donor site, a clotting agent is applied and nothing further is done. The part is protected by a cradle until dry. After the crust has dried, rubbing of clothing will not disturb it. About ten days later the patient tubs the part and the crust falls off, or it need not be disturbed and will fall off or be gently pulled off a few days later.

SUMMARY

Methods of free skin grafting are the open, closed and intermediate methods. Important factors to be considered in the open method are as follows:

(1) Epidermis has no direct blood supply but lives on tissue fluid. We attempt to set the stage so that ever flowing springs of tissue fluid seep from the body into the free skin graft. (2) Clot is body glue. We depend upon the adhesive qualities of the clot to stick the graft to the body and not to bandages in an attempt to achieve the same result. (3) Secondary tissue is substitute tissue. Ideally in secondary healing wounds we discard it; practically this is not always advisable. (4) Protection of the properly applied graft is the essence of success in free skin grafting. This may be accomplished with and without bandages. (5) Success in free skin grafting by the open method proves that control of edema by bandages is erroneous or, if true, is unimportant. (6) Complete immobilization is not necessary for success in free skin grafting. Soft undulating movements are not harmful because the graft is held to the recipient area by elastic clot. (7) Any area not subject to trauma or which can be protected from trauma and which is not subject to acute or twisting movements can be treated by the open method. (8) Color changes noted in the free skin grafts during the course of healing are probably due to variations in the thickness of the grafts and changes in the recipient area. (9) Donor sites are not bandaged but are openly protected until dry. (10) Advantages of the open method of treating free skin grafts, open wounds and donor sites are reflected in the limited use of hospital personnel, hospital equipment and bandages. (11) The value in using bobbinet on the Padgett dermatome is that tension is made on the fabric and not on the skin when the graft is removed from the dermatome. "Backed" grafts (bobbinet or vaseline gauze) eliminate considerable suturing. Fabrics made of fine thread woven in a hexagonal pattern allow stretch in all directions. When this is rubberized, a transparent membrane is formed, suturing through it is made easy by dabbing mineral oil or vaseline over the areas which will be pierced with a needle. Cotton fabric is preferred for reasons described

in a previous article but nylon and rayon fabrics are satisfactory. Any of the fabrics may be sterilized by soaking in ether in the operating room. They dry immediately after being removed from the container.

Acknowledgment: The author wishes to express his appreciation toward Drs. Earl J. Halligan, Joseph Ruvaine and Wm. J. Lavelle for the interest shown in these case studies.

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Case Reports

SOLITARY EOSINOPHILIC GRANULOMA OF RIB*

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EOSINOPHILIC granuloma of bone first received attention as a clinical entity in 1940 when four independent reports appeared in the American literature.[1,8,10,12] Prior to 1940 several bone lesions characterized by the presence of eosinophil cells had been reported. These are mentioned in a detailed review of the literature and bibliography of the subject presented in 1948 by Baker and Fisher.[11]

A review of the published reports indicates that the etiology of this pathologic entity is unknown. Some anatomic features such as recent callus formation, broken-down fragments of original bone, dissection and fraying out of the periosteum suggest trauma as an etiologic agent. The possibility that the disease may be the result of a virus infection is suggested by Lichtenstein and Jaffe. Smears and cultures have been repeatedly negative. The relationship between eosinophilic granuloma, Hand-Schüller-Christian disease and Letterer-Siwe disease has been discussed by several writers. It is likely that each of these diseases represents a distinct clinical expression of a single pathologic process.[3–10]

Otani and Ehrlich[10] describe four main types of cells: (1) typical giant cells of the osteoclastic type; (2) an enormous number of eosinophilic polymorphonuclear cells; (3) large pale mononuclear cells and occasional cells containing two or three nuclei; and (4) lymphocytes. There are a few small areas of necrosis present in the tissue containing necrotic debris, blood pigment and blood. Occasional products of repair are suggested by the presence of fibrous tissue and bone callus. Lichtenstein and Jaffe[8] state that the lesion is moderately vascular, being permeated by capillaries and thin-walled blood vessels. The supporting tissue framework is delicate.

The most frequent symptom is local pain or discomfort. Soft tissue swelling and tenderness over the site of the lesion may be present. The systemic manifestations if any include slight fever, anorexia, malaise, headache and weight loss.[2,3,7]

The diagnosis should be suspected in any individual in later childhood or adult life who presents himself with localized pain or tenderness, particularly over a flat bone, with or without mild systemic signs of infection. Eosinophilia may range from normal to 11 per cent.[3,13] Although eosinophilic granuloma may be a solitary lesion, a careful search should be made for the presence of multiple lesions. Biopsy of the lesion will establish the diagnosis.

Roentgen therapy, biopsy and curettage or wide excision, depending upon the site of the lesion, have given excellent results in patients with single lesions.[8] When multiple lesions are present, the prognosis is uncertain.

CASE REPORT

A thirty-eight year old white male was admitted to the Urology Service of the Veterans Administration Hospital, McKinney, Texas, on December 9, 1947, with a history of pain in the region of the right costovertebral angle of four weeks' duration. The pain was described as sharp and unremitting in character. The patient also stated that he had had four attacks of severe, constant pain in the right lower chest during the past month lasting about two hours and relieved only by morphine. Each attack was more severe than the preceding one and was followed by soreness localized to the lower right

* From the Veterans Administration Hospital, McKinney, Tex. Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

chest in the posterior axillary line. Family and past history were not contributory.

The patient appeared to be in excellent health and the physical findings were unremarkable except for a small, firm, tender mass attached to the right eleventh rib in the posterior axillary line. The mass was fixed to the rib but not to the overlying soft tissues. There was no appreciable amount of soft tissue swelling. The blood, urine and serologic studies were normal. Cholesterol, cholesterol esters, acid and alkaline phosphatase determinations were normal. The basal metabolism rate was −18. X-ray revealed a destructive lesion 1.2 by 3.0 cm. in size involving the posterior arc of the eleventh rib. A survey of the long bones, hands, spine and skull failed to demonstrate any other lesions.

The patient was transferred to the Thoracic Surgery Service and operation was performed on December 19, 1947, under local infiltration anesthesia. A firm, fusiform swelling of the rib measuring about 2 by 4½ cm. was isolated. The mass was firmly adherent to the underlying pleura which was excised with the tumor *en bloc*.

The pathologic report was as follows: The gross specimen consisted of a segment of rib measuring 13 cm. in length, 1 cm. in width and .6 cm. in thickness. In the central portion was a fusiform mass measuring 5 by 2½ by 3 cm. Attached to one surface of the mass was muscle and to the opposite surface was a strip of pleura measuring 3½ by 1.7 cm. The rib and mass were of firm consistency and appeared well encapsulated but the rib was fractured at midpoint. On section the mass appeared to arise within the rib, was expansile in type and on cross section measured 1.2 by 1.7 cm. One margin of the mass was composed of bone. The pleural margin had a dense, gray, fibrous capsule but no identifiable bone. Within the center of the mass were small spicules of bone interspersed through the somewhat uniform, gelatinous, yellow-grey tumor tissue. The pleura was densely adherent to the mass although it could be slightly retracted from the cut margin. The muscular portion received with the mass was less densely adherent but here again the contiguous muscle bundles could not be stripped except with extreme difficulty.

The microscopic sections revealed the central portion of the rib, including the entire medullary canal and in some areas the cortex, to be involved in a granulomatous process consisting of many eosinophils and multinucleated giant cells containing the phagocytized eosinophils as well as other phagocytized material. There was a fairly generous fibrous tissue proliferation accompanying the granulomatous lesion and there were several areas of coagulation necrosis within the lesion itself. The bone surrounding the area was markedly hyperplastic and many areas of cartilage and new bone formation were to be seen. On cutting half of the rib in its long axis the process was found microscopically to extend only about one-half of the way to the end of the specimen. The giant cells in most cases were multinucleated. Their cytoplasm was lightly basophilic and generous in amount. Their nuclei were large, pale and slightly vesicular. As previously mentioned many contained phagocytized eosinophils; others cellular debris. Occasional giant cells were mononucleated. In addition to the many nests of eosinophils present throughout the lesion there was a generalized infiltration of chronic inflammatory cells and occasional polymorphonuclears. The diagnosis was eosinophilic granuloma of rib.

The postoperative course was uneventful. There had been a daily elevation of temperature up to 99.4°F. during the preoperative period of observation. On the third day after resection of the tumor the patient's temperature became normal and remained so until discharge from the hospital on the fourteenth day. The patient was well two years later.

SUMMARY

Although eosinophilic granuloma of bone is seen relatively infrequently, its importance lies in the prognostic value of differentiating it from malignant neoplasms of bone. Seven cases of solitary lesions involving rib have been found in the literature. Single lesions in bone have been successfully treated with roentgen therapy or local excision. When multiple lesions are present, the prognosis is uncertain. A case of solitary eosinophilic granuloma of rib treated with local resection is reported.

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EVEN in cases of intussusception in which a palpable mass seems to be localized to the left side of the abdomen the operative incision should be in the region of the cecum since the final stage and often the most difficult part of the reduction of the intussusception will almost invariably be at the cecum. Authorities are opposed to medical management and to attempts to reduce an intussusception by means of barium enemas since the bowel may already be gangrenous. In such instances further delay and procrastination may result in intestinal perforation and fatal peritonitis. Ware et al. recently found that in children and infants about one-fifth of the patients had enlarged ileocecal lymph nodes and obviously these may be of etiologic importance in the causation of intussusception. (*Richard A. Leonardo, M.D.*)

PRESACRAL NEUROFIBROMA

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TUMORS ventral to the sacrum are rare. Ewing[1] gives an incidence of one in 34,582 tumors of the newborn. The Mayo Clinic[2–4] records only fifty or one of every 30,000 admissions. Presacral neurofibromas are even more rare, only three having been found reported in the entire literature.[2,5]

Middeldorpf[6] in 1885 first reported a case of retroperitoneal presacral teratoma in a child. Since then many different types of presacral tumors have had the loose diagnostic term of Middeldorpf tumor applied to them. However, this name should be reserved for those teratomatous tumors arising from the postanal hindgut.

The development of a presacral neurogenic tumor is explained by the embryology of the nervous system.[5] It is believed that remnants of the spinal medulla are left behind along the pathway taken by the spinal cord when it is attenuated by the growth of the vertebral column. During early embryonic life the cord and vertebral column are of equal length but the latter grows at a greater rate.

The symptoms of a presacral tumor are usually the following:[2,5] local pain, tenderness, constipation, and urinary retention or urinary incontinence due to sacral nerve involvement. Our case had none of the aforementioned as the presenting complaint. However, the patient did have a decrease in his ability to maintain erection during sexual intercourse. Further questioning revealed the presence of pain. Rectal and pelvic examination will reveal the presence of a mass anterior to the sacrum. A roentgenogram of the pelvis may reveal erosion of the sacrum.

The differential diagnosis of a presacral neurofibroma covers a wide range of conditions including the following:[4] tumors of the uterus, ovaries or fallopian tubes; lymph node involvement by metastasis or by a lymphomatous condition; perirectal abscess; adenomyosis; spinal cord tumor and any of the remaining members of the presacral or Middeldorpf tumor group. Dockerty's division of the latter group is listed as follows: Congenital: presacral teratomas, presacral dermoids, anterior sacral meningocele and pelvic kidney. Bone tumor: giant cell tumor, Ewing's tumor, osteogenic sarcoma, myeloma and chordoma. Neurogenic: neurofibroma, ganglioneuroma, neuroblastoma, glioma and ependymoblastoma. Miscellaneous: lipoma, hemangioma, lymphoblastoma and other tumors.

The treatment of a presacral neurofibroma is surgical removal. The technical difficulties that may be encountered are familiar to any abdominal surgeon. One must constantly guard against making a diagnosis of a malignancy from the presence of a firm retroperitoneal mass, especially without a biopsy. Because of this we believe surgical excision should be done if at all possible. One may be rewarded by the removal of a potentially malignant growth, thus saving a patient's life. We believe this has been true in our case.

CASE REPORT

C. T. (U-72770), a fifty-four year old white male, was admitted to the hospital on February 14, 1950, and discharged on March 13, 1950. The patient went to his physician with a complaint of decreasing ability to maintain an erection during sexual intercourse. This complaint had been present for a period of two months. The patient's family history was noncontributory. Past history revealed the following positive features: bilateral hernia repair and appendectomy in 1947; frequent exertional dyspnea with palpitation; chronic cough productive of a small amount of yellowish white sputum; rare dysuria and nocturia; indigestion of one year's duration, consisting of epigastric fulness and pain, increasing in severity in the two months prior to admission. Present illness began about two months before admission at which time the patient began to notice a decrease in his ability to maintain an erection during sexual intercourse. His libido remained unchanged. Two months before admission he noticed occasional dull, aching pain across his lower sacral and sacroiliac regions. Bowel habits remained unchanged except for an occasional

loose stool in the past two months. There was a weight loss of 15 pounds in the past two months. Physical examination revealed the following positive features: temperature, 99°F. (rectal); pulse, 86; respiration, 20; blood pressure, 112/78 mm. Hg (right arm); roughening of breath sounds at both bases with occasional terminal expiratory wheezes; distant heart sounds; bilateral hernia incision scars, with positive impulse and bulge in mid-incision on left; ¾ cm. diameter, firm, non-tender nodule in the subcutaneous fat in the right mid-abdomen; symmetrically enlarged prostate (second degree). On rectal examination just inside the external sphincter anterior to the sacrum and bulging into the lumen there was a 12 to 15 cm. sized, round, nodular, non-tender mass, seemingly attached to the sacrum posteriorly.

In the preoperative course at the hospital sigmoidoscopy for 10 inches revealed an intact but slightly edematous mucosa overlying the mass. Laboratory data were as follows: white blood count 10,600, 82 per cent polymorphonuclear forms, 17 per cent lymphocytes, 1 per cent monocytes, hematocrit −51 per cent, serologic test for syphilis negative, blood urea −39 mg. per cent, blood sugar −83 mg. per cent, acid phosphatase −0.45 King-Armstrong units; electrocardiographic tracing negative; x-ray of lumbosacral spine was negative except for an enlarged calcified node projected through the mid-abdomen. Stool examinations were negative for blood. Complete urine examination was negative, with a specific gravity of 1.028. Preoperative preparation consisted of six days of sulfathalidine (9 gm./day) and saline enemas twice a day.

On February 20, 1950, the patient was operated upon under nasotracheal cyclopropane and ether after a sodium pentothal® induction. First the patient was put up in dorsal lithotomy position and an incision made lateral to the perineal body from the anus to the ischiorectal fossa. The coccyx was resected and the tumor mass freed, by blunt dissection, from the fascia propria of the sacrum and on all sides except the cephalic aspect. A perineal pack was inserted and the patient placed in the dorsal decubitus for a low midline, suprapubic incision. The peritoneal reflection on either side of the sigmoid was opened and the mass enucleated by blunt dissection with preservation of the blood supply to the sigmoid. The ureters were visualized and undamaged. The peritoneal reflections were closed. The abdomen was closed. The patient received 1,500 cc. of blood and 500 cc. of 5 per cent glucose in distilled water during the procedure. The anesthetic chart and course were smooth and uneventful. The patient's postoperative course was uneventful except for a period of inability to void spontaneously and pain with a sciatic distribution type. The urinary problem cleared with the aid of urecholine so that by two weeks postoperatively the patient voided spontaneously without urecholine. The pain cleared with the administration of priscoline.® Supportive parental fluids, parenteral vitamins, crude liver extract, penicillin and aureomycin completed the therapeutic regimen. The patient's perineal wound healed well with azochloramid irrigations and hot tub baths. The abdominal wound healed well also. The postoperative laboratory work—hematocrit, urea, total protein concentration and the albumin/globulin ratio—maintained a steady normal level. On discharge, March 13, 1950, the patient was voiding well, the abdominal wound was well healed, the perineum was clean and granulating well, and complete neurologic examination was negative. The patient was last seen two months postoperatively and was completely well and healed. However, there had been no improvement of the chief complaint for which the patient had entered the hospital.

The pathologic report was as follows: The specimen consisted of a resected tumor mass, measuring 12 by 8 by 7 cm. It was lobulated and encapsulated. The tissue was moderately firm. On section the cut surface had a varied appearance. Portions of the tumor were yellow and opaque. There were several brown, cystic areas as well as tiny foci of calcification. Microscopically, the appearance was that of a neurofibroma with several areas of increased cellularity.

SUMMARY

A brief review of Middeldorpf tumors and presacral neurofibromas has been presented. A case of presacral neurofibroma has been described, making the fourth such case to be reported. This presents a new symptom and an interesting technical problem.

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Riedel's struma and Hashimoto's disease of the thyroid are distinct entities, Crile and Rumsey remind us, and are not to be confused with instances of acute, subacute or chronic thyroiditis. Acute thyroiditis is a fulminating and self-limiting type of disease that fortunately responds well to radiation therapy. Viruses may be important etiologic factors; some cases follow malaria, scarlet fever or measles. Sore throat, painful deglutition and localized tenderness over the thyroid are suggestive signs of this diagnosis. Fever is present and often there is radiation of pain to one or both mastoid regions. Temperature may go as high as 104°F. Loss of weight (averaging 10 pounds) is common, especially in the more severe cases. Hyperthyroidism may be present although usually in only one of four patients. Sedimentation rate is elevated, as one would expect, but, surprisingly, the white count is apt to be normal. Radioactive iodine is ineffective but roentgen therapy readily produces a cure. (*Richard A. Leonardo, M.D.*)

USE OF THE POLYETHYLENE CATHETER FOR JEJUNOSTOMY FEEDING*

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RUBBER tubing or catheters as ordinarily employed in jejunostomies are objectionable in that they are irritating to the tissues and excoriation of the skin from leakage of digestive juices around the tube is frequent. Because of this factor and because of the cramps and diarrhea so frequently encountered jejunal feeding has not been employed as often as it probably should be.

The discomfort from administration of the formula has been largely overcome by the recent development of better tolerated formulas,[1,2] especially those using homogenized milk as a base.

There are many indications for both short term and prolonged jejunal alimentation, particularly for correcting the malnutrition of patients undergoing radical surgery who are unable to take a suitable diet either orally or by gavage feeding, such as obstructive lesions of the esophagus and stomach. Jejunostomy is also useful as a palliative procedure for prolonged feeding in cases of inoperable obstructing lesions of the esophagus and stomach.

The non-irritating properties of pure polyethylene when implanted in living tissue has been described by Ingraham,[3] Brown,[4] Grindlay[5] and others. They described several clinical applications of this new plastic. Recently the author[6] had occasion to use the polyethylene catheter,† as designed by Diamond,[7] for prolonged gastric feeding. The successful use of the tube for this purpose suggested its possible application to tube jejunostomies. It has proven so satisfactory in three cases of carcinoma of the stomach as a palliative feeding jejunostomy that it was considered worth reporting. A review of the literature revealed no report of this tubing having been used for this purpose.

† Tubing obtainable from the Suprenant Electrical Insulation Company, Boston, Mass.

CASE REPORTS

CASE 1. C. T. A., a fifty-three year old Negro male, was admitted to the Veterans Administration Hospital on September 30, 1949, complaining of abdominal pain and vomiting. His initial symptoms of abdominal pain began in April, 1949. He had lost weight in the few months prior to admission. Physical examination disclosed a mass in the left upper quadrant of the abdomen. X-ray examination of the stomach showed extensive carcinoma.

On October 10th a laparotomy was performed and exploration revealed carcinoma of the stomach which was fixed and inoperable. Since pyloric obstruction was already becoming manifest, a palliative feeding jejunostomy was established using an 18 gauge polyethylene catheter. The catheter was inserted into the jejunum 30 cm. from the ligament of Treitz and brought out through a small stab wound in the left flank. The loop of jejunum was then sutured to the anterior abdominal wall at the site of the stab wound with interrupted sutures. The external portion of the tube was secured to the skin with adhesive tape.

Jejunal feedings of homogenized milk fortified with protein hydrolysate and hydrolyzed starch were started on the third postoperative day. A 50 cc. syringe with an 18 gauge blunted needle attached was used to administer the formula. In spite of the small diameter of the tubing relatively little pressure was required to force the formula through it. Two hundred cubic centimeters of formula were given every two hours during the patient's waking hours. He was able to administer his own tube feedings and was discharged from the hospital on his tenth postoperative day. On October 30th the tube broke off flush with the skin (due to a defect in the tube) and was replaced with a 15 gauge polyethylene catheter. (The larger

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FIG. 1. Case II. Polyethylene catheter (15 gauge) used as a feeding jejunostomy.

sized catheter proved to be more satisfactory and was used in subsequent cases.) Feedings were resumed and continued until the patient's death on November 19, 1949. Autopsy was not obtained but extensive carcinomatosis was considered to be the cause of death. There was no evidence of skin irritation due to the tube or digestive juices. The patient experienced no discomfort from his feedings and took very little by mouth from October 10th until his death five weeks later, subsisting entirely on his jejunostomy feedings.

CASE II. L. C., a thirty-one year old white male, was admitted to the Veterans Administration Hospital on August 29, 1949, complaining of abdominal pain and vomiting. He had lost weight in the past three months. On June 2nd he had had a palliative gastric resection for carcinoma of the cardia of the stomach at another hospital. Physical examination revealed emaciation and a mass in the epigastrium. X-ray examination of the stomach showed a patent esophagogastrostomy but considerable gastric retention.

On December 9th a laparotomy was performed because of pyloric obstruction. The obstruction of the pylorus was found to be due to angulation caused by the previous extensive resection. A Finney pyloroplasty was performed and a jejunostomy established using a 15 gauge polyethylene catheter. (Fig. 1.) Jejunal feeding was started on the third postoperative day and continued as supplemental feedings. The patient was able to take small amounts of food by mouth but depended largely on the jejunal alimentation for subsistence as he continued to have some pyloric obstruction.

FIG. 2. Case III. Polyethylene catheter (15 gauge) used as a feeding jejunostomy.

The patient died on February 15, 1950, and autopsy showed the cause of death to be extensive carcinomatosis. There was no ulceration or erosion of the jejunum caused by the tube and no inflammatory reaction in the abdominal wall. The tube did not break or become plugged at any time during the two months the patient survived.

CASE III. F. H., a forty-three year old Negro male, was admitted to Hermann Hospital on March 23, 1950, complaining of abdominal pain, nausea and vomiting. The nausea and vomiting had begun in December, 1949. The patient had lost 6 pounds in the month prior to admission. Physical examination was essentially negative except for slight emaciation. X-ray examination of the stomach showed a large ulcer on the greater curvature.

On March 24th a laparotomy was performed revealing a large, inoperable carcinoma of the stomach with extension to the pylorus. As the patient was already showing evidence of pyloric obstruction, a 15 gauge polyethylene catheter was inserted into the proximal jejunum as a jejunostomy. (Fig. 2.) Jejunal feeding was

started on the third postoperative day. The patient was discharged on the fifth postoperative day and feedings were continued at home by his wife. He took only small amounts of water by mouth and no food.

He died on June 2, 1950. Autopsy was not obtained but carcinomatosis was considered to be the cause of death. There was no evidence of ulceration or erosion of the skin due to the tube and no cramps or diarrhea as a result of the feeding. During the two months the patient received jejunostomy feedings there was no plugging or other difficulty encountered with the tube.

SUMMARY

1. Jejunostomy feeding is infrequently employed because of the inconvenience and discomfort associated with the use of rubber tubing.

2. A review of the literature has revealed no cases of polyethylene tubing used for this purpose.

3. Three cases are presented in which a Witzel jejunostomy employing a polyethylene catheter was used for jejunal alimentation for periods varying from five weeks to two months.

4. The small diameter of the tube, its flexibility and its non-irritating properties combine to make it an ideal tube for this purpose.

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New Instruments

DESCRIPTION OF THE MEYERDING HIP AND SHOULDER BONE SKID*

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THE hip and shoulder bone skid was especially designed for use in the performance of surgery of the hip or shoulder so that it would facilitate reduction or dislocation of the head of the femur or head of the humerus. I have designed it so that it is long enough to give sufficient leverage. It has also been provided with a handle of sufficient size to control the spatula-like blade. This blade fits the rounded head of the femur or humerus; it has no sharp edges, can be forced between the head and the acetabulum, and may be used as an aid in dislocating or replacing the head of the femur or humerus. (Fig. 1.)

In cases of long-standing dislocations of the hip or shoulder a dull instrument such as this is essential and it has been found after years of experience that this one works exceptionally well. It has proved most efficient in the dislocation and reduction of the femoral head during the performance of cup arthroplasty of the hip. It also has been found useful in the reduction of old dislocations or in excision of the head of the humerus since it is dull and does not damage the soft tissues in the axillary space.

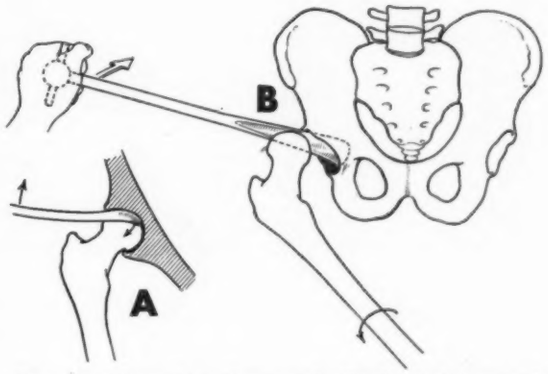

FIG. 1. A, Shows how the spatula-like blade is inserted into the acetabulum and the direction of the force exerted to aid in displacement of the head of the femur; B, shows how the head of the femur is displaced and slid outward and upward along the bone skid.

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STERILE LIGHT FOR ATTACHMENT IN THE OPERATIVE FIELD

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IN many surgical procedures the problem of inadequate illumination has been difficult to overcome. This is present particularly in

FIG. 1. Assembled lamp on left; small lamp with transformer on right.

neurosurgery. There is a constant struggle between the surgeon and circulating assistants as to the proper placing of the overhead and floor lamps. Because of this a source of illumination has been devised which can be controlled by the surgeon, focusing a bright beam of light on the point where it is most needed. Illuminated retractors although of value have often been difficult to control.

The light illustrated in Figure 1 helps relieve many of the technical difficulties involved when working in such areas as the chiasmal region, between laminas in disc explorations, at the cerebellopontine angle, in trigeminal root sections and within the thoracic cage when performing sympathectomies.

This apparatus has two prime advantages. (1) It is easily sterilized by soaking in 70 per cent alcohol including the cord which is attached to the lamp housing. (2) It can be clipped by means of the screw clamp to any available suitable surface.

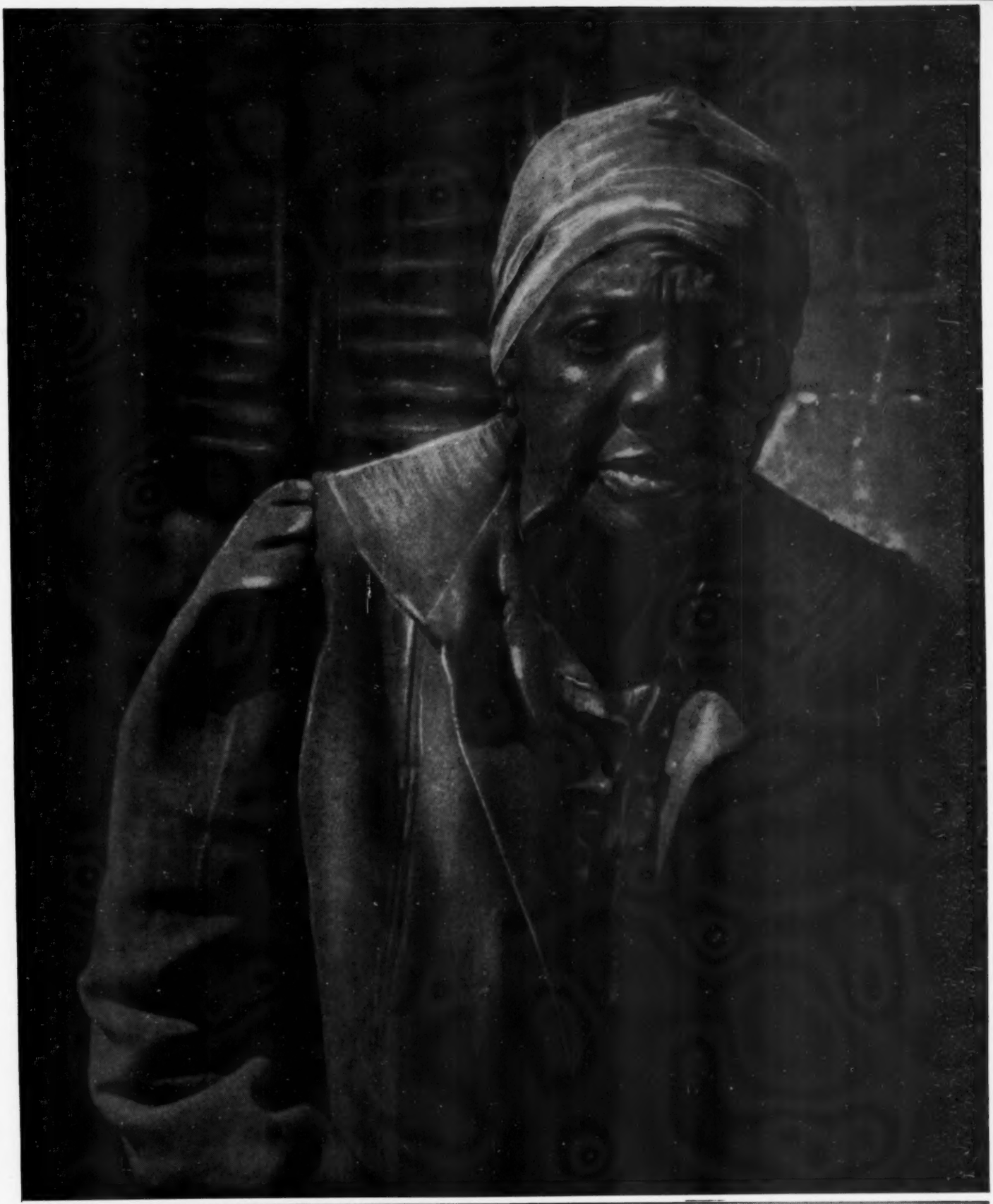
Sterilization. The method of sterilization which has been employed is as follows: The lens and bulb are removed and all three parts are soaked in alcohol for twenty minutes. Several additional bulbs are placed in the alcohol in case changes are necessary. The object in removing the bulb is to permit the socket to be sterilized, eliminating any of the hazards for introducing infection. After removal from the alcohol the socket is dried and the apparatus quickly assembled.

Placing of the Lamp. The screw clamp gives the surgeon a light that can be used as needed and where needed. It can be clamped on the cut edge of the skull, on a spinous process, to a self-retaining retractor or to a rib. The several universal type joints allow the lamp housing to be placed in any part of the operative field at any height and angle. Thus it can even be placed within the thoracic cage and the light beam directed where desired.

The cap containing the lens slides up and down to give a focusing beam. At a distance of 11 cm. the intensity of the light as measured by a G. E. photographic exposure meter with the lid closed is 50 foot candles. The optimum area brightly illuminated at 11 cm. varies between 3 and 1.5 cm. depending on the focusing. The bulb used is 6 volts, 0.5 ampere. The focusing mount consists of a plano-convex lens fixed at one end of a metal cylinder which slides on the lamp housing. The lamp never becomes too hot to adjust by hand.

The smaller lamp housing can readily be attached to the universal joints. It is more easily adaptable to such procedures as trigeminal root sections in which the field of vision is rather small and a large beam is not needed.*

* These lights are manufactured by the National Electric Instrument Company, 92–21 Corona Avenue, Elmhurst, N. Y.



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1. McClintock, J. C.: N. Y. State J. Med. 1951 (In Press)

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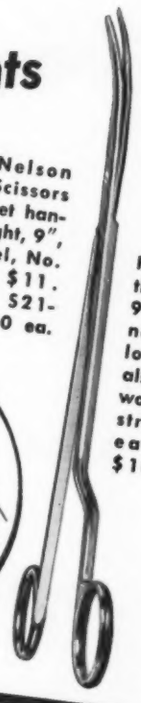
Improved Nelson Lobectomy Scissors with one offset handle ring, straight, 9", stainless steel, No. S21-436¼ $11. Curved, No. S21-438¼ $11.70 ea.



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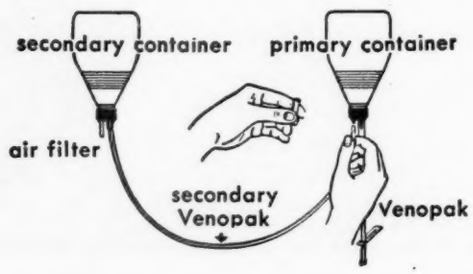

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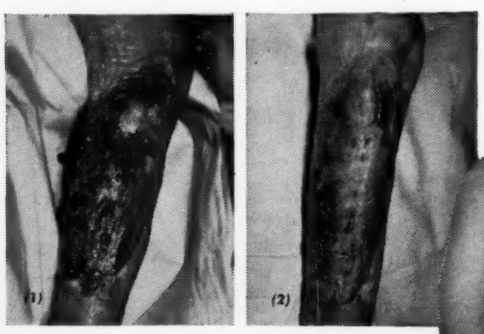

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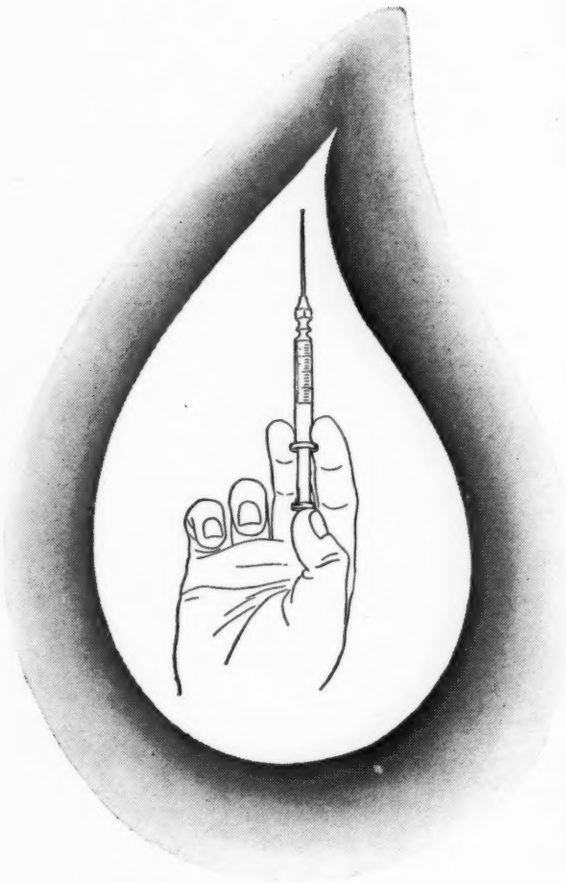

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BIBLIOGRAPHY

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*Cannon, P. R.: Recent Advances in Nutrition with Particular Reference to Protein Metabolism, Lawrence, Kansas, University of Kansas Press, 1950.

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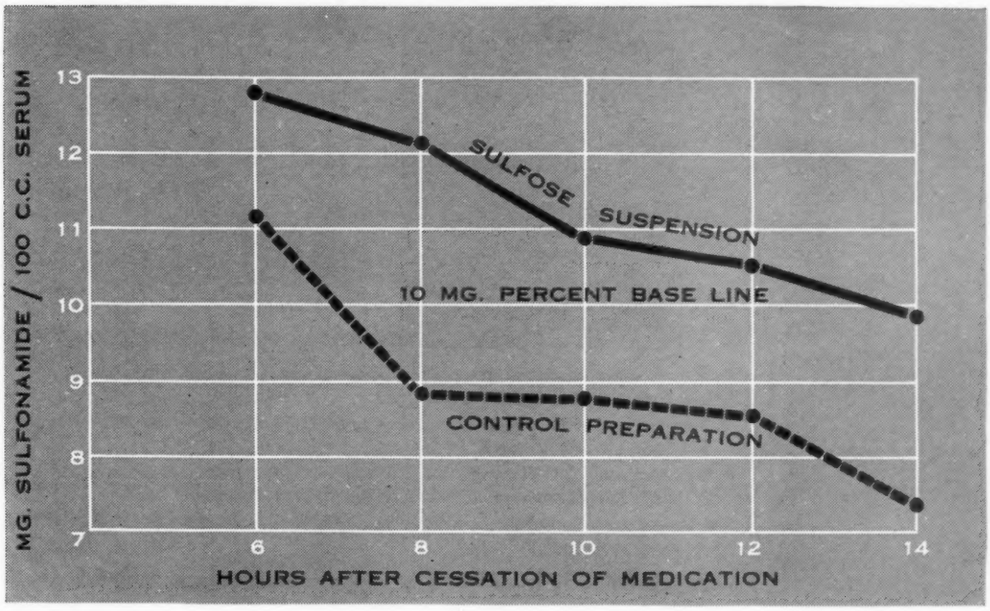

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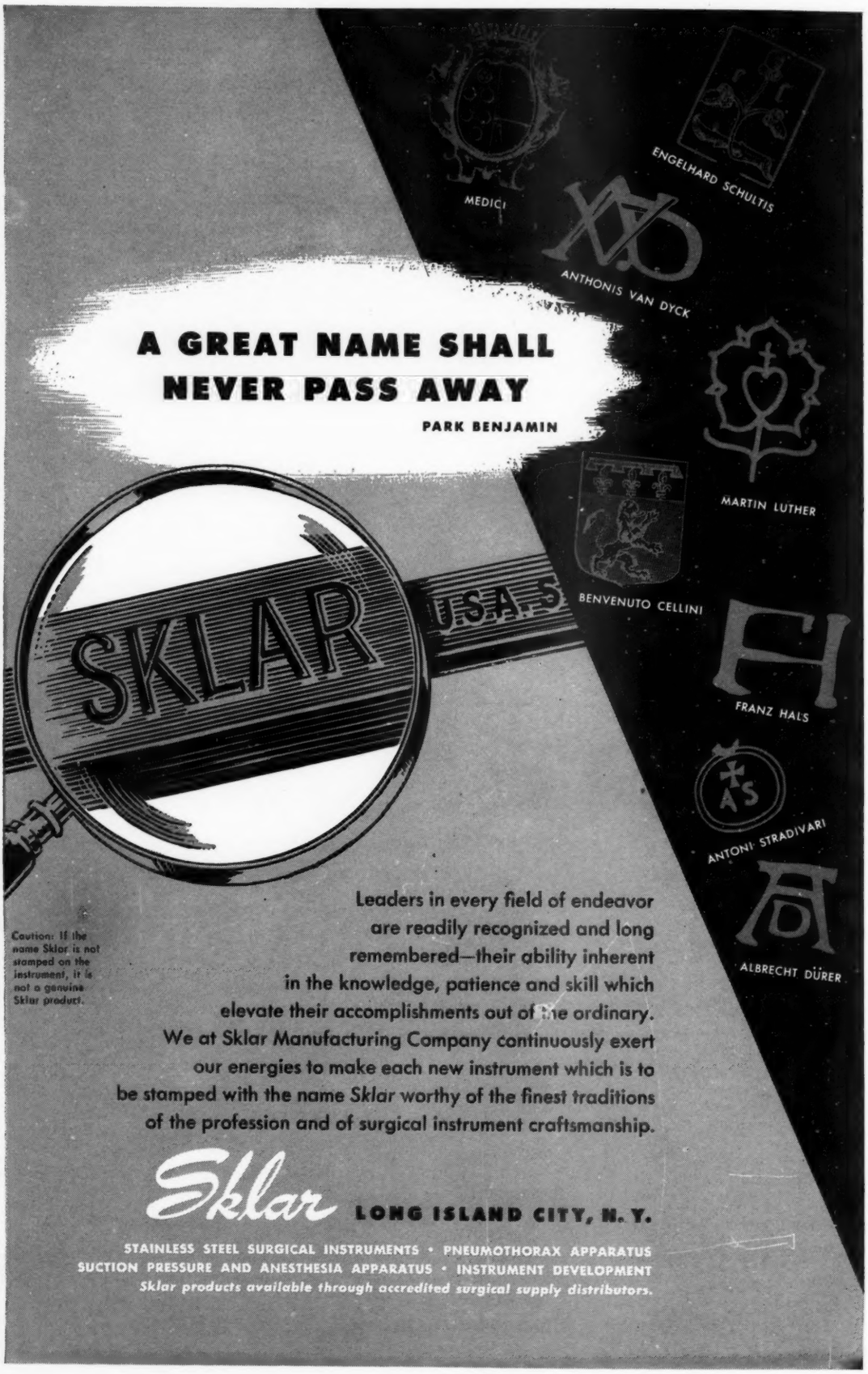
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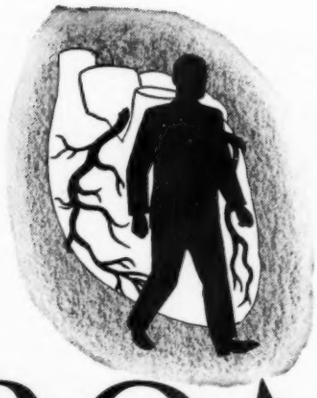

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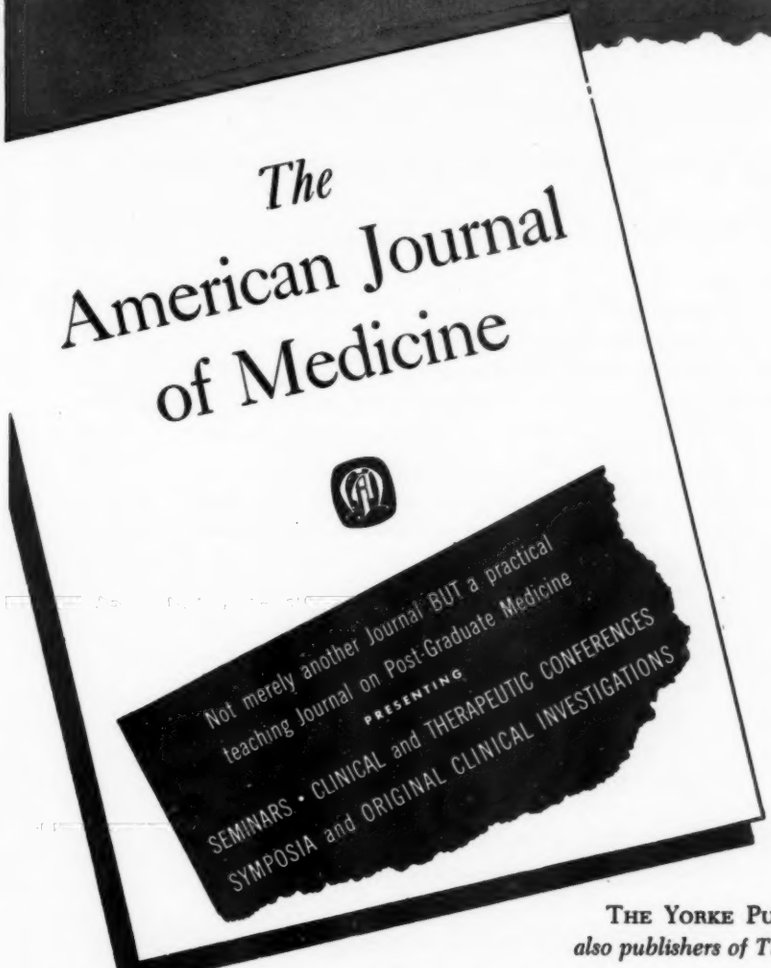
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Propper Manufacturing Co. Inc.	8
Ritter Co. Inc.	19
The Shampaine Co.	9
Sklar Manufacturing Co.	46
Edward Weck & Co. Inc.	35
Wilmot Castle Co.	48
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Sutures

Davis & Geck, Inc.	15
J. A. Deknatel & Son, Inc.	11
Ethicon Suture Laboratories.	*Insert Facing Page* 8
Gudebrod Bros. Silk Co. Inc.	33

Pharmaceuticals

Abbott Laboratories	36
American Hospital Supply Corp.	4
Ames Co., Inc.	August
Baxter Laboratories	4
Chatham Pharmaceuticals, Inc.	23
Ciba Pharmaceutical Products, Inc.	34, *Back Cover*
Commercial Solvents Corp.	50
Cutter Laboratories	30–31
Desitin Chemical Co.	August
Dome Chemicals, Inc.	44
Eaton Laboratories, Inc.	38
Geigy Company, Inc.	47
Harvey Laboratories, Inc.	August
Lederle Laboratories Division	22
Eli Lilly and Company	32
Mallinckrodt Chemical Works	39
Merck & Company	40
Parke Davis & Co.	41
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A. H. Robins Co., Inc.	18
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E. R. Squibb & Sons	6
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Wyeth, Inc.	43

Hospital Supplies

American Hospital Supply Corp.	4
C. R. Bard, Inc.	August
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Clay-Adams, Inc.	August
Cutter Laboratories	30–31
Johnson & Johnson	21
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Post-Graduate Instruction

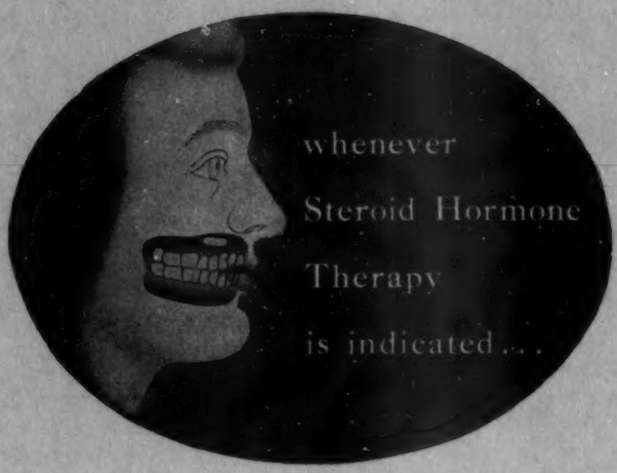
Cook County Grad. Sch. of Med.	45
N. Y. Polyclinic Med. School	45

Foods

American Meat Institute	August
The Wander Company	42

Miscellaneous

Outside the Ivory Tower	24, 26, 28
The Surgeon's Mart	25, 27, 29



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2. Lieser, H., et al.: Postgraduate Med. 8:393, November, 1950

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